

TECHNICAL SPECIFICATIONS AND CONTRACT DOCUMENTS

FOR

**SLIDELL POLICE DEPARTMENT FACILITY
FUNCTIONAL DEPENDENT DESIGN**

**CITY OF SLIDELL, LOUISIANA
DEPARTMENT OF ENGINEERING**

**CITY OF SLIDELL PROJECT NO. 3001-24
CITY OF SLIDELL BID NO. 26-B015**



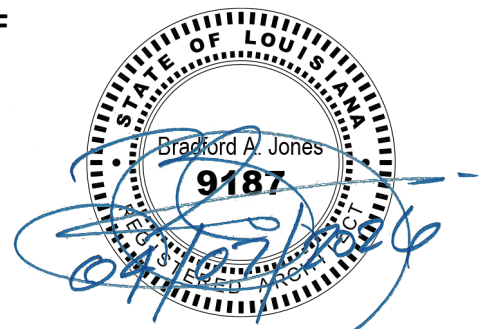
Prepared by:



**MP DESIGN GROUP
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BID DOCUMENTS

APRIL 2026



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ADVERTISEMENT FOR BIDS

SLIDELL POLICE DEPARTMENT FACILITY

SLIDELL JOB NO. 3001-24

Bid No. 26-B015

SEALED BIDS will be received by the City of Slidell at the Office of the Finance Director, 2045 2nd St., Suite 214, Slidell, Louisiana, until 10:00 A. M. Central Time on Thursday, June 4, 2026, for the above referenced project, for the CITY OF SLIDELL, LOUISIANA. Bids will be publicly opened and read aloud thereafter in the in the Slidell City Council Chambers, suite # 319, 2045 Second St, Slidell, LA 70458. Any bid received after closing time will be returned unopened.

The Contractor shall hold a Louisiana Contractor's license in Building Construction.

Only bids from contractors who secure Contract Documents from the Architect or who utilize Central Bidding to obtain Contract Documents shall be considered as responsive bidders for this project. A non-mandatory pre-bid meeting will be held on Wednesday, May 20, 2026 at 1:00 PM CST in the Slidell City Council Chambers, (suite # 319), 2045 Second St, Slidell, LA 70458. The pre-bid meeting may include a non-mandatory visit to the project site.

All bids shall be accompanied by bid security in an amount of five percent (5.0%) of the sum of the base bid and all alternates. The form of this security shall be as stated in the Instructions to Bidders included in the Bid Documents for this project. An executed affidavit and attestation form must be submitted prior to bid award.

Contract Documents may be examined and secured for **\$500 per set** from the **Architect, MP Design Group, PLLC, 918 Howard Ave, Suite F, Biloxi, MS 39530, (228) 388-1950, www.mpdesigngroup.us**. Contract Documents are also available for public inspection at the Slidell Engineering Dept..

Bidders also have the option to review bid documents and submit bids electronically by visiting www.centralbidding.com. Electronic bids will require a digital signature. You must register directly with Central Bidding to utilize this service. You may also contact them at 833-412-5717.

The signature on the bid must be that of an authorized representative of the corporation, partnership or other legal entity as defined by Louisiana Public Bid Law Revised Statute 38:2212.A.(1)(c) which dictates parties authorized to submit bids for public contracts. All required Certificates of Liability Insurance shall list the City of Slidell as “additionally insured”.

All applicable Federal, State, Local laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout.

All proposals, bids and applications are welcomed. The city encourages participation by Minority, Women-Owned, and Disadvantaged Business Enterprise firms.

Deposits are refundable to bonafide prime bidders and will be 50% refundable to all others with return of complete and unmarked documents no later than 10 days after receipt of Bids.

The bids shall be presented in a sealed envelope clearly marked:

SEALED BIDS: SLIDELL POLICE DEPARTMENT FACILITY
SLIDELL JOB NO. 3001-24
LOUISIANA CONTRACTOR'S LICENSE NO. _____
Bid No. 26-B015

Opening : DATE JUNE 4, 2026
10:00 A.M. CST

The City of Slidell reserves the right to reject any or all bids.

Blair Ellinwood
CITY OF SLIDELL
Finance Director

Advertise: WEDNESDAY, APRIL 29, 2026
WEDNESDAY, May 6, 2026
WEDNESDAY, May 13, 2026

BIDDER'S CHECKLIST

- ☐ Bid Forms including all unit prices and bid sheets. (Remember: In case of mathematical discrepancies the unit price shall take precedence – so check the unit prices and extensions carefully).
- ☐ Authorized signature of bidder on bid forms.
- ☐ Bid Bond or bid security.
- ☐ Bidder is advised to pay strict attention to bond requirements.
- ☐ Acknowledge all addenda.
- ☐ Contractor's name and license number on the outside of the envelope.
- ☐ Proper labeling as bid for the project on outside of the envelope.
- ☐ Delivered to the Office of the Finance Director.

LOUISIANA UNIFORM PUBLIC WORKS BID FORM

TO: CITY OF SLIDELL

P.O. BOX 828
SLIDELL, LA 70459

BID FOR: SLIDELL POLICE DEPARTMENT

FACILITY

JOB NUMBER 3001-24

BID NUMBER: 26-B015

The undersigned bidder hereby declares and represents that she/he; a) has carefully examined and understands the Bidding Documents, b) has not received, relied on, or based his bid on any verbal instructions contrary to the Bidding Documents or any addenda, c) has personally inspected and is familiar with the project site, and hereby proposes to provide all labor, materials, tools, appliances and facilities as required to perform, in a workmanlike manner, all work and services for the construction and completion of the referenced project, all in strict accordance with the Bidding Documents prepared by: MP Design Group and dated: April 7, 2036.

Bidders must acknowledge all addenda. The Bidder acknowledges receipt of the following **ADDENDA** (Enter the number and date the Designer has assigned to each of the addenda that the Bidder is acknowledging):

No. ____ Dated: _____ No. ____ Dated: _____ No. ____ Dated: _____

TOTAL BASE BID: For all work required by the Bidding Documents (including any and all unit prices designated "Base Bid" * but not alternates) the sum of:

_____ Dollars (\$_____)

ALTERNATES: For any and all work required by the Bidding Documents for Alternates including any and all unit prices designated as alternates in the unit price description.

Alternate No. 1 (*Provide an alternate to construct the vehicle processing building in its entirety as shown in the drawings and specifications.*) for the lump sum of:

_____ Dollars (\$_____)

Alternate No. 2 (*Provide an add alternate to install powder coated steel window shrouds, solid surface counters, and solid surface windowsills as called for in the drawings and specifications*) for the lump sum of:

_____ Dollars (\$_____)

Alternate No. 3 (*Provide a deduct alternate to construct asphalt site pavement with concrete curb and gutter in lieu of concrete site pavement with vertical concrete curb as called for in the drawings and specifications*) for the lump sum of:

_____ Dollars (\$_____)

NAME OF BIDDER: _____

ADDRESS OF BIDDER: _____

LOUISIANA CONTRACTOR'S LICENSE NUMBER: _____

NAME OF AUTHORIZED SIGNATORY OF BIDDER: _____

TITLE OF AUTHORIZED SIGNATORY OF BIDDER: _____

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER **: _____

DATE: _____

**THE FOLLOWING ITEMS ARE TO BE INCLUDED WITH THE SUBMISSION OF THIS
LOUISIANA UNIFORM PUBLIC WORK BID FORM:**

* The Unit Price Form shall be used if the contract includes unit prices. Otherwise it is not required and need not be included with the form. The number of unit prices that may be included is not limited and additional sheets may be included if needed.

** **A CORPORATE RESOLUTION OR WRITTEN EVIDENCE** of the authority of the person signing the bid for the public work as prescribed by LA R.S. 38:2212(B)(5).

BID SECURITY in the form of a bid bond, certified check or cashier's check as prescribed by LA R.S. 38:2218(A) attached to and made a part of this bid.

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned,

as Principal, and _____

as Surety, are hereby held and firmly bound unto

_____ as OWNER in the penal sum of
_____ for the payment of which,

well and truly to be made, we hereby jointly and severally bind ourselves, successors
and assigns.

Signed this _____ day of _____, 2026. The Condition of the
above obligation is such that whereas the Principal has submitted to
_____ a certain BID, attached hereto and hereby made a
part hereof to enter into a contract in writing, for the

NOW, THEREFORE,

a) If said BID shall be rejected, or

b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID) and shall furnish a BOND for his 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 the agreement created by the acceptance of said BID, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood 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.

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 accept such BID; and said 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: _____

NOTE: Surety bonds shall be procured according to Louisiana State Law. Any surety bond written for a public works project shall be written by a surety or insurance company currently on the U. S. Department of the Treasury Financial Management Service list of approved bonding companies which is published annually in the Federal Register, or by a Louisiana domiciled insurance company with at least an A-rating in the latest printing of the A. M. Best's Key Rating Guide to write individual bonds up to ten percent of policyholders' surplus as shown in the A. M. Best's Key Rating Guide or by an insurance company that is either domiciled in Louisiana or owned by Louisiana residents and is licensed to write surety bonds.

AFFIDAVIT

STATE OF LOUISIANA

PARISH OF _____

BEFORE ME, the undersigned authority personally came and appeared,

_____, who after first being sworn, deposes and
says: that he is _____ (a partner of the firm of, etc.)

_____. The party making the foregoing Proposal or
bid; that such bid is genuine and not collusive or a sham; that said bidder has not
colluded, conspired, connived, or agreed directly or indirectly, with any bidder 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 of affiance 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 SLIDELL, State of Louisiana, (Owner),
or any person interested in the proposed Contract; and that all statements contained in
said proposal or bid, or the contents thereof, or divulged information or data relative
hereto to any association or any member or agent thereof, are true.

SWORN TO AND SUBSCRIBED

BEFORE ME ON THIS _____

DAY OF _____, 2026

(Notary Public)

My commission expires _____.

CONTRACT FORM
FOR
SLIDELL POLICE DEPARTMENT FACILITY
CITY OF SLIDELL, LOUISIANA
BID NO: 26-B015
SLIDELL JOB NO. 3001-24

THIS AGREEMENT, made this _____ day of _____, 2026 at the City of Slidell, Parish of St. Tammany, State of Louisiana by and between the City of Slidell, Louisiana, hereinafter called "Owner" and _____, hereinafter called the "Contractor."

WITNESSETH THAT, the Owner and Contractor do mutually agree as follows:

1. In consideration of the price for the work herein specified in the bid proposal to be paid by the Owner to the Contractor at the time and in a manner hereinafter provided, the Contractor does hereby agree to construct complete in every detail as follows:

SLIDELL POLICE DEPARTMENT FACILITY
CITY OF SLIDELL, LOUISIANA
BID NO. 26-B015
SLIDELL JOB NO. 3001-24

in compliance with the Advertisement of Bids, Proposal Form, Contract, Performance Bond, General Conditions, Specifications, Plans, and such Addenda thereto as may be issued prior to execution of this Contract, all in a thorough and workmanlike manner. Owner shall be listed as an additional insured on Contractor's general liability policy.

2. This price shall include the cost and expense to furnish all materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, transportation, and other accessories and services necessary to complete this project, in accordance with the Contract Documents.

3. The Contractor shall commence work under this Contract within **ten (10) days** from the date of the written "Notice to Proceed" issued by the Owner. The Contractor shall complete all work under the Contract within **Five Hundred and Forty (540 Calendar Days)** from the date of the "Notice to Proceed." The Owner has determined, and the Contractor agrees, that the liquidated damages for a delay in completion of this Contract will be **One Thousand Dollars (\$1,000.00)** per calendar day in excess of the stated time of completion.

4. That upon satisfactory completion of the work and approval by the Engineer, the Owner will issue a written acceptance of the work to the Contractor, who will immediately thereafter file same with the Recorder of Mortgages in St. Tammany Parish.

5. A retainage of ten percent (10%) shall be withheld from each progress payment. Upon successful clearance of the lien, the Contractor shall submit a final invoice, with the clear lien certificate, for payment by the Owner in accordance with invoice payment procedures outlined in Article 14.13 Final Payment. The retainage amount for contracts \$500,000.00 or greater shall be five percent (5%).

6. The Owner agrees to pay the Contractor for the performance of the Contract as provided in the Specifications, and to make monthly payments on account thereof provided in the General Conditions. The contract amount, as presented in bid by Contractor, is \$_____.

7. Owner and Contractor specifically agree and declare that Owner shall be deemed and considered the statutory employer of Contractor's employees.

8. INDEMNITY AND HOLD HARMLESS

_____(Other Party) agrees to indemnify and hold harmless the City of Slidell and the City's officers, employees, and agents, from and against any and all claims, losses, liabilities, demands, suits, causes of action, damages, settlements, money judgments, or expenses of any kind, including reasonable attorney fees and costs, accruing against the City of Slidell or the City's officers, employees, or agents, arising out of the acts of omissions of _____(Other Party) while engaged in, about, or in connection with the discharge or performance of the terms of this Agreement, but excepting any liability for loss or damage resulting from the negligence or intentional acts or omissions of the City of Slidell, the City's officers, employees, or agents, or any third party over which _____(Other Party) has no control.

9. *Provision Required by Law Deemed Inserted:* Each and every provision of law and clause required by law to be inserted in this Agreement shall be deemed to be inserted herein, and the Agreement shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the Agreement shall forthwith be amended to make such insertion or correction.

10. *Severability:* Each and every part, term, or provision of this Agreement is severable from the others. Notwithstanding any possible future finding by a duly constituted authority that a particular part, term, or provision is invalid, void, or unenforceable, this Agreement has been made with the clear intention that the validity and enforceability of the remaining parts, terms, and provisions shall not be affected thereby unless the cause of this Agreement would be defeated thereby.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed in **three (3)** original counterparts on the day and year first hereinabove written.

WITNESSES:

Contractor

Signature

Printed Name

Title

WITNESSES:

CITY OF SLIDELL

Owner

Signature

Randy Fandal

Printed Name

Mayor

Title

PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we (1) *

_____ and (2) *

_____ hereinafter called "Principal" and (3) *

_____ a Surety Company
authorized to do and doing business in the State of Louisiana, hereinafter called
"Surety" are held and firmly bound unto the Mayor of the City of Slidell, Louisiana,
hereinafter called "Owner" in penal sums of

_____ dollars
(\$ _____) Performance Bond and _____ dollars
(\$ _____) Payment Bond in lawful money of the United States, for the payment of
which sum well and truly to be made, we bind ourselves, our heirs, executors,
administrators, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that, whereas, the Principal entered
into a certain contract with the Owner dated the _____ day of _____,
2026, a copy of which is hereto attached and made a part hereof for the furnishing of:

SLIDELL POLICE DEPARTMENT FACILITY
SLIDELL JOB NO. 3001-24

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all
the undertakings, covenants, terms, conditions and agreements of said contract during
the original term thereof which may be granted by the owner, with or without notice to
the Surety, and if he shall satisfy all claims and demands incurred under such contract,
and shall fully indemnify and save harmless the Owner from all costs and damages
which it may suffer by reason of failure to do so, and shall reimburse and repay the
Owner all outlay and expense which the Owner may incur in making good any default,
and shall promptly make payment to all persons, firms, subcontractors, and
corporations furnishing materials for or performing labor in the prosecution of the work
provided for in such contract, and any authorized extension or modification thereof,
including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs
on machinery, equipment, and tools, consumed or used in connection with the
prosecution of such work, and all insurance premiums on said work whether by
subcontractor or otherwise, 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, alterations or addition to the terms of the
contract or to the work to be performed thereunder or the specifications accompanying
the same shall in anywise 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 of the Specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is execute in **three (3)** originals each one of which shall be deemed an original, this the _____ day of _____, 2026

ATTEST: _____
(Principal Secretary) Principal

BY: _____

Address

Witness as to Principal

Address

ATTEST:

(Surety) Secretary

(SEAL) _____
Surety

Witness as to Surety BY: _____
Attorney-in-Fact

Address Address

NOTE: DATE OF BOND MUST NOT BE PRIOR TO DATE OF THIS AGREEMENT.

- * 1. Correct name of Contractor.
- * 2. A Corporation, a partnership, or an Individual, as case may be.
- * 3. Correct name of Surety.

CHANGE ORDER FORM

CITY OF SLIDELL, LOUISIANA

Change Order No.: _____

Date: _____

Contract Recordation Date: _____

Instrument No.: _____

Name of Project:

Project No.:

Engineer:

Contractor:

It is hereby mutually agreed that when this change order has been signed by the contracting parties the following described changes in the work required by the contract shall be executed by the contractor without changing the terms of the contract except as herein stipulated and agreed. The parties hereto certify that this Change Order is consistent with and within the original scope of this Contract.

Description of Changes:

Justification for Changes:

Contractor's Proposal for the Above Described Change:

I/We hereby agree to the modifications of the contract as described above and furnish all materials and labor and perform all work in connection therewith in accordance with the requirements for similar work in existing contract except as otherwise stipulated herein, for the following consideration:

Name of Project: _____

Contractor: _____

Contractor's Signature

Contractor's Printed/ Typed Name

Change Order No. _____

Name of Project: _____

Architect/ Engineer: _____

Architect/ Engineer's Signature

Architect/ Engineer's Printed/ Typed Name

RECOMMENDED BY: City of Slidell, Engineering Department

BY: _____
Blaine Clancy, City Engineer

DATE: _____

APPROVED BY:

BY: _____
Randy Fandal, Mayor

DATE: _____

STATEMENT OF CONTRACT AMOUNT:

	COST	TIME (DAYS)
ORIGINAL CONTRACT AMOUNT	\$ _____	_____
PREVIOUS ADDITION	\$ _____	_____
TOTAL	\$ _____	_____
PREVIOUS DEDUCTIONS	\$ _____	_____
NET PRIOR TO CHANGE	\$ _____	_____
AMOUNT OF CHANGE (ADD)	\$ _____	_____
CONTRACT AMOUNT TO DATE	\$ _____	_____



CITY OF SLIDELL

CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT NAME:

PROJECT NUMBER: _____

INSTRUMENT NUMBER: _____

DATE OF RECORDATION: _____

CONTRACT DATE: _____

OWNER:

City of Slidell
P O Box 828
Slidell LA 70459

CONTRACTOR:

The Work performed under this Contract has been reviewed and found, to the Architect/Engineer's best knowledge, information, and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of the Substantial Completion of the Project or portion designated above is the date of issuance established by this Certificate, which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

A list of items to be completed or corrected is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment.

Cost estimate of Work that is incomplete or defective \$ _____.

The Contractor will complete or correct the Work on the list of items attached hereto **within Forty-five (45) days** from the above date of Substantial Completion.

_____ Contractor	_____ Signature	_____ Date
_____ Architect/Engineer	_____ Signature	_____ Date

The Owner accepts the Work or designated portion as substantially complete

(date of substantial completion).

_____ The City of Slidell Owner	_____ Blaine Clancy, City Engineer	_____ Date
_____ The City of Slidell Owner	_____ Randy Fandal, Mayor	_____ Date

INSTRUCTIONS TO BIDDERS

1. DEFINED TERMS

Terms used in these Instructions to Bidders which are defined in the Standard General Conditions of the Construction Specifications have the meanings assigned to them in the General Conditions.

2. QUALIFICATIONS OF BIDDERS

To demonstrate his qualifications for the Project, each Bidder must be prepared to submit within five days of Owner's request written evidence of the types set forth in the Supplementary Conditions or General Conditions, such as financial data, previous experience and evidence of authority to conduct business in the jurisdiction where the Project is located.

3. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

- 3.1 Before submitting his Bid, each bidder must (a) examine the Contract Documents thoroughly, (b) visit the site to familiarize himself with local conditions that may in any manner affect performance of the Work, (c) familiarize himself with Federal, State and local laws, ordinances, rules and regulations affecting performance of the Work; and (d) carefully correlate his observations with the requirements of the Contract Documents.
- 3.2 The submission of a Bid will constitute an incontrovertible representation by the Bidder that he has complied with every requirement of this Article 3.

4. INTERPRETATIONS

All questions about the meaning or intent of the Contract Documents shall be submitted to Engineer in writing. Replies will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the bidding documents. Questions received less than five days prior to the date of opening of Bids will not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

5. BID SECURITY

The amount and type of Bid Security is stated in the Invitation to bid. The required security must be in the form of a certified or bank cashier's check made payable to Owner or a bid bond issued by a surety licensed to conduct business in the state. Surety bonds shall be procured according to Louisiana State Law. Any surety bond written for a public works project shall be written by a surety or insurance company currently on the U.S. Department of the Treasury Financial Management Service list of approved bonding companies which is published annually in the Federal Register, or by a Louisiana domiciled insurance company with at least an A rating in the latest printing of the A. M. Best's Key Rating Guide to write individual bonds up to ten percent of policyholders' surplus as shown in the A. M. Best's Key Rating Guide. The Bid Security of the successful Bidder will be retained until he has executed the Agreement and furnished the required Contract Security, whereupon it will be returned; if he fails to execute Security within 10 days of the Notice of Award, Owner may annul the Notice of Award and the Bid Security of that Bidder will be forfeited. The Bid Security of any Bidder whom the Owner believes to have a reasonable chance of receiving the award may be retained by Owner until

the earlier of the seventh day after the executed Agreement is delivered by Owner to Contractor and the required Contract Security is furnished or the sixty-first day after the Bid opening. Bid Security of other Bidders will be returned within seven days of the Bid opening.

6. CONTRACT TIME

6.1 The number of days for the completion of Work (the Contract Time) is set forth in the Contract Form and will be included in the executed Agreement. Any provisions for liquidated damages are set forth in the Contract Documents. The contract time is established in calendar days.

6.2 If Work cannot proceed due to weather or other conditions not under the control of the contractor for 65% or more of the normal work day, then that day may be added to the contract time in subsequent change order if verified by the City's inspector. Rain days will not be granted for weekends or holidays unless those days were requested as work days and approved in writing by the Slidell Engineering Dept. at least 48 hours prior to commencing the weekend or holiday work. Holidays for the City of Slidell include New Year's Day, Martin Luther King Day, Mardi Gras Day, President's Day, Good Friday, Memorial Day, 4th of July, Labor Day, Veterans Day, Thanksgiving and the day after Thanksgiving, Christmas Eve, Christmas Day, and New Year's Eve.

7. SUBCONTRACTORS, ETC.

7.1 If the Supplementary Conditions or Specifications require the identity of certain Subcontractors and other persons and organizations to be submitted to Owner in advance of the Notice of Award, the apparent low Bidder, any other Bidder so requested, will within seven days after the day of the Bid opening submit to Owner a list of all Subcontractors and other persons and organizations (including those who are to furnish the principal items of material and equipment) proposed for those portions of the Work as to which such identification is so required. Such list shall be accompanied by an experience statement with pertinent information as to similar projects and other evidence of qualification for each such Subcontractor, person and organization if requested by Owner. If Owner or Engineer after due investigation has reasonable objection to any proposed Subcontractor, other person or organization, he may before giving the Notice of Award request the apparent low Bidder to submit an acceptable substitute without an increase in his Bid price. If the apparent low Bidder declines to make any such substitution, he will thereby sacrifice his Bid Security.

7.2 In contracts where the Contract Price is on the basis of Cost of the Work Plus a Fee, Contractor, prior to the Notice of Award, must identify in writing the Owner those portions of the Work that he proposes to subcontract and after the Notice of Award may only subcontract other portions of the Work with Owner's written consent.

8. BID FORM

8.1 The Bid Form is included in the Contract Documents; additional copies may be obtained from Engineer.

8.2 Bid Forms must be completed legibly in ink or by computer. The Bid price of each item on the form must be stated in numerals. In case of mathematical discrepancies the unit price shall take precedence. When the bid price is requested in words and figures, this shall be done. In case of a discrepancy in these prices, the words shall take precedence. Any interlineations, alterations, or erasures must be initialed.

8.3 The authority of the person submitting the bid shall meet the criteria as defined in Louisiana Revised Statute 38:2212.A.(1)(c) shown here:

:

Louisiana Revised Statute 38:2212.1.A.(c)(i) Evidence of agency, corporate, or partnership authority shall be required for submission of a bid...The authority of the signature of the person submitting the bid shall be deemed sufficient and acceptable if any of the following conditions are met:

(aa) The signature on the bid is that of any corporate officer listed on the most current annual report on file with the secretary of state, or the signature on the bid is that of any member of a partnership or partnership in commendams listed in the most current partnership records on file with the secretary of state. Or;

(bb) The signature on the bid is that of an authorized representative of the corporation, partnership, or other legal entity and the bid is accompanied by a corporate resolution, certification as to the corporate principal, or other documents indicating authority which are acceptable to the public entity.

Or;

(cc) The corporation, partnership, or other legal entity has filed in the appropriate records of the secretary of state in which the public entity is located, an affidavit, resolution, or other acknowledged or authentic document indicating the names of all parties authorized to submit bids for public contracts. Such document on file with the secretary of state shall remain in effect and shall be binding upon the principal until specifically rescinded and canceled from the records of the office.

8.4 Bids by partnerships must be executed in the partnership name and signed by a partner, his title must appear under this signature and the official address of the partnership must be shown below the signature.

8.5 All names must be typed or printed below the signature.

8.6 The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which shall be filled in on the Bid Form).

8.7 An executed affidavit, contained in the contract documents, shall be submitted prior to bid award.

9. SUBMISSION OF BIDS

Bids shall be submitted at the time and place indicated in the Invitation for Bid and shall be submitted in an opaque sealed envelope, marked with the Project title, name and address of the Bidder, Contractor's license number for state in which the work is to be done, and accompanied by the Bid Security and other required documents.

10. MODIFICATION AND WITHDRAWAL OF BIDS

Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids. Any interlineations, alterations, or erasure must be initialed.

11. OPENING OF BIDS

Bids shall be opened as indicated in the Invitation to Bid.

12. BIDS TO REMAIN OPEN

All Bids shall remain open for 45 days after the day of the Bid Opening, unless noted otherwise in the Advertisement for Bids; however, Owner may, in their sole discretion, release any Bid and return the Bid Security prior to that date.

13. AWARD OF CONTRACT

13.1 Owner reserves the right to reject any and all Bids and Waive any and all informalities, and the right to disregard all nonconforming or conditional Bids or counter proposals.

13.2 In evaluating Bids, Owner shall consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, and alternates and unit prices if requested in the Bid forms. He may consider the qualifications and experience of Subcontractors and other persons and organizations (including those who are to furnish the principal items of material or equipment) proposed for those portions of the Work as to which the identity of Subcontractors and other persons and organizations to do the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time. Owner reserves the right to reject the Bid of any Bidder who does not pass any such evaluation to Owner's satisfaction.

13.3 If a contract is to be awarded, it will be awarded to the lowest responsible Bidder whose evaluation by Owner indicates to Owner that the award will be in the best interests of the Project and the Owner.

13.4 If the contract is awarded, Owner will give the apparent successful Bidder a Notice of Award within 45 days, unless noted otherwise in the Advertisement for Bids.

13.5 Simultaneously with delivery of the executed counterparts the agreement to Owner, Contractor shall deliver to Owner the required Contract Security.

13.6 Bids may be rejected if conditions described in Act No. 864 of House Bill 1490 or Act No. 945 of House Bill 1292 are discovered.

13.7 In accordance with La. R.S. 38:2227 and LA. R.S. 38:2212.10, each bidder on this project must submit the completed Attestation Clause (Past Criminal Convictions of Bidders and Verification of Employees) form found within this bid package. The Attestation Clause form shall be submitted to the City of Slidell within 10 days after the opening of bids.

13.8 If any city permits are required for construction, associated permits fees will not be assessed for this project.

Name of Project

Project No.

ATTESTATIONS

Appearer, as a Bidder on the above-entitled Public Works Project, does hereby attest that:

LA. R.S. 38:2227 PAST CRIMINAL CONVICTIONS OF BIDDERS

- A. No sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes:
- | | |
|--|------------------------------------|
| (a) Public bribery (R.S. 14:118) | (c) Extortion (R.S. 14:66) |
| (b) Corrupt influencing (R.S. 14: 120) | (d) Money laundering (R.S. 14:230) |
- B. Within the past five years from the project bid date, no sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes, during the solicitation or execution of a contract or bid awarded pursuant to the provisions of Chapter 10 of Title 38 of the Louisiana Revised Statutes:
- | | |
|--|--|
| (a) Theft (R.S. 14:67) | (f) Bank fraud (R.S. 14:71.1) |
| (b) Identity Theft (R.S. 14:67.16) | (g) Forgery (R.S. 14:72) |
| (c) Theft of a business record
(R.S.14:67.20) | (h) Contractors; misapplication of payments
(R.S. 14:202) |
| (d) False accounting (R.S. 14:70) | (i) Malfeasance in office (R.S. 14: 134) |
| (e) Issuing worthless checks
(R.S. 14:71) | |

LA. R.S. 38:2212.10 Verification of Employees

- A. Appearer is registered and participates in a status verification system to verify that all employees in the state of Louisiana are legal citizens of the United States or are legal aliens.
- B. If awarded the contract, Appearer shall continue, during the term of the contract, to utilize a status verification system to verify the legal status of all new employees in the state of Louisiana.
- C. If awarded the contract, Appearer shall require all subcontractors to submit to it a sworn affidavit verifying compliance with Paragraphs (A) and (B) of this Subsection.

NAME OF BIDDER

NAME OF AUTHORIZED SIGNATORY OF BIDDER

DATE

TITLE OF AUTHORIZED SIGNATORY OF BIDDER

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER

GENERAL CONDITIONS

GENERAL CONDITIONS

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GENERAL CONDITIONS

ARTICLE 1--DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

ADDENDA--Addenda include additions and changes to plans or specifications issued by the Engineer prior to the reception of bids, and must be considered by the Contractor as a part of the original plans and specifications. Upon signing of the Contract, all Addenda will be included as a part of the contract documents.

ADVERTISEMENT--The advertisement published by the Owner giving notice of a request for bids.

AGREEMENT--The written agreement between Owner and Contractor covering the Work to be performed; other Contract Documents are attached to the Agreement.

APPLICATION FOR PAYMENT--The form furnished by Engineer which is to be used by Contractor in requesting progress payments and which is to include the schedule of values required by Paragraph 14.1 and an affidavit of Contractor that progress payments theretofore received on account of the Work have been applied by Contractor to discharge in full all of Contractor's obligations reflected in prior Applications for Payment.

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

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

BONDS--Bid, performance and payment bonds and other instruments of security, furnished by Contractor and his surety in accordance with the Contract Documents.

CHANGE ORDER--A written order to Contractor signed by Owner authorizing an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Time issued after execution of the Agreement.

CONTRACT DOCUMENTS--The Agreement, Addenda (whether issued prior to the opening of Bids or the execution of the Agreement), Instructions to Bidders, Contractor's Bid, the Bonds, the Notice of Award, these General Conditions, the Supplementary Conditions, the Specifications, Drawings, Modifications, and Change Orders.

CONTRACT PRICE--The total monies payable to Contractor under the Contract Documents.

CONTRACT TIME--The number of days stated in the Agreement for the completion of the work, computed as provided in Paragraph 17.2.

CONTRACTOR--The person, firm or corporation with whom Owner has executed the Agreement.

CREW: The number of persons required for the performance of work at a site as determined by the Contractor in response to task difficulty and safety considerations at the time or location of the work.

DAY--A calendar day of twenty-four hours measured from midnight to the next midnight.

DRAWINGS--The drawings which show the character and scope of the Work to be performed and which have been prepared or approved by Engineer and are referred to in the Contract Documents.

EASEMENT: A liberty, privilege, or advantage without profit which the Owner of one parcel of land may have in the land of another. In this agreement, all land, other than public streets, in which the Owner has sewer system lines or installations and right of access to such lines or installations.

EASEMENT ACCESS: Areas within an easement to which access is required for performance of work.

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

FIELD ORDER--A written order issued by Engineer which clarifies, or interprets the Contract Documents in accordance with Paragraph-9.3 or orders minor changes in the Work in accordance with Paragraph 10.2.

INITIALS

ASTM	American Society for Testing Materials
ACI	American Concrete Institute
AASHTO	American Association of State Highway and Transportation Officials
AWWA	American Water Works Association

INVITATION TO BID: The advertisement published by the Owner giving notice of a request for bids.

LINEAR FOOT: Being one foot. In these specifications used to denote unit of measurement related to the length of a sewer line.

MODIFICATION--(a) A written amendment of the Contract Documents signed by both parties, (b) a Change Order, (c) a written clarification or interpretation issued by Engineer in accordance with Paragraph 9.3 or (d) a written order for a minor change or alteration in the Work issued by Engineer pursuant to Paragraph 10.2. A Modification may only be issued after execution of the Agreement.

NOTICE OF AWARD--The written notice by Owner to the apparent successful Bidder stating that upon compliance with the conditions precedent to be fulfilled by him within the time specified; Owner will execute and deliver the Agreement to him.

NOTICE TO PROCEED--A written notice given by Owner to Contractor (with a copy to Engineer) fixing the date on which the Contract Time will commence to run and on which Contractor shall start to perform his obligations under the Contract documents.

OWNER: The Owner is the City of Slidell.

PAYMENT FOR WORK: Payment for the items shown in Schedule of Bid Prices shall include all incidental items necessary to complete the work.

PERFORMANCE BOND: The approved form of security furnished by the Contractor and his Surety as a guarantee of the proper performance of the work and payment for all materials or other obligations contracted by him in the prosecution thereof.

PLANS--The Plans, cross sections, working drawings and supplemental drawings, or exact reproductions thereof, which show the locations, character, dimensions, and details of the work to

be done, and which are to be considered as a part of the contract, supplementary to these specifications.

PROJECT--The entire construction to be performed as provided in the Contract Documents.

RESIDENT PROJECT REPRESENTATIVE--The authorized representative of Engineer who is assigned to the Project site or any part, thereof.

SHOP DRAWINGS--All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by Contractor, Sub-contractor, manufacturer, supplier or distributor and which illustrate the equipment, material or some portion of the Work.

SITE: Any location where work has been or will be done.

SITE ACCESS: An adequately clear area of a size sufficient to accommodate personnel and equipment required at the location where work is to be performed, including roadway or surface sufficiently unobstructed to permit conveyance of vehicles from the nearest paved roadway to the work location.

SPECIFICATIONS--Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work. The Specifications shall be considered to generally include, but not limited to, the contract documentation forms, the general conditions, supplemental conditions, technical specifications, and any addenda.

STORM SEWER: A sewer intended to carry only storm waters, surface runoffs, street washwaters, and drainage.

STREET ACCESS: Areas normally used for public vehicular traffic (including roads, streets, or rights-of-way extending twenty feet from either side of the traversing area) to which safe access is required for performance of work.

SUBCONTRACTOR: An individual, firm, or corporation having a direct contract with the Contractor or with any other lower-tier Subcontractor for performance of part of the work.

SUBSTANTIAL COMPLETION--The date as certified by the engineer when the construction of the Project or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the Project or specified part can be utilized for the purposes for which it was intended; or if there be no such certification, the date when final payment is due in accordance with Paragraph 14.13.

SURETY: The corporate body, licensed to do business in the State where the work is located, which is bound with and for the Contractor, and which is primarily liable and responsible for the payment of all obligations pertaining to and for the acceptable performance of the work required by the Contractor.

SWALE (DIP, SAG): A significant deviation in pipe grade such as to cause entrapment of solids, semisolids, and liquids, thereby impeding the accuracy and/or effectiveness of flow measurements, cleaning, and internal-inspection.

TESTING LABORATORY: Any testing laboratory designated or approved by the Engineer to perform tests of materials entering the work.

WORK--Any and all obligations, duties and responsibilities necessary to the successful completion of the Project assigned to or undertaken by Contractor per the Contract Documents, including all labor, materials, equipment and other incidentals, and the furnishing thereof.

ARTICLE 2--PRE-CONSTRUCTION PROVISIONS

AWARD OF CONTRACT

- 2.0 The award of the Contract, if it be awarded, will be by the Owner to the lowest responsible Bidder whose Proposal shall have complied with all the requirements necessary to render it formal. The successful Bidder will be notified by email or letter mailed to the address shown on his Proposal that his bid has been accepted and that he has been awarded the Contract. No award will be made to any Contractor until their bond and insurance requirements are made satisfactory to the Owner.

EXECUTION OF AGREEMENT:

- 2.1 At least the number of counterparts specified in the contract form of the Agreement and such other Contract Documents as practicable will be executed and delivered by Contractor to Owner within fifteen days of the Notice of Award; and Owner will execute and deliver one counterpart to Contractor within ten days of receipt of the executed Agreement from Contractor. Owner, Contractor and Engineer shall each receive an executed counterpart of the Contract Documents and additional confirmed copies as required.

One set of the Executed Contract Documents shall be filed by the Owner at the expense of the Contractor. Once the actual costs for recording the contract are known, the Slidell City Attorney will contact the Contractor to request a check be prepared and sent to the City Attorney for these costs. The City Attorney will then have the Contract recorded with the Clerk of Court or the Recorder of Mortgages in St. Tammany Parish.

DELIVERY OF BONDS:

- 2.2 When he delivers the executed Agreements to Owner, Contractor shall also deliver to Owner such Bonds as may be required in accordance with Paragraph 5.1.

COPIES OF DOCUMENTS:

- 2.3 Owner shall furnish to Contractor up to three (3) copies (unless otherwise provided in the Supplementary Conditions) of the Contract Documents. Additional copies will be furnished, upon request, at the cost of reproduction.

CONTRACTOR'S PRE-START REPRESENTATIONS:

- 2.4 Contractor represents that he has familiarized himself with, and assumes full responsibility for having familiarized himself with, the nature and extent of the Contract Documents, Work, locality, and with all local conditions and Federal, state and local laws, ordinances, rules and regulations that may in any manner affect performance of the Work, and represents that he has correlated his study and observations with the requirements of the Contract Documents. Contractor also represents that he has studied all surveys and investigation reports of subsurface and latent physical conditions referred to in the General Conditions of the Specifications and made such additional surveys and investigations as he deems necessary for the performance of the work at the Contract Price in accordance with the requirements of the Contract Documents and that he has correlated the results of all such data with the requirements of the Contract Documents.

COMMENCEMENT OF CONTRACT TIME: NOTICE TO PROCEED:

- 2.5 The Contract Time will commence to run on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within thirty days after the day on which Owner delivers the executed Agreement to Contractor.

STARTING THE PROJECT:

- 2.6 Contractor shall start to perform his obligations under the Contract Documents within ten (10) days of the date when the Contract Time commences to run. No Work shall be done at the site prior to the date on which the Contract Time commences to run.

BEFORE STARTING CONSTRUCTION:

- 2.7 Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. He shall at once report in writing to Engineer any conflict, error or discrepancy which he may discover; however, he shall not be liable to Owner or Engineer for his failure to discover any conflict, error or discrepancy in the Drawings or Specifications.
- 2.8 Within ten (10) days of delivery of the executed Agreement by Owner to Contractor, Contractor shall submit to Engineer for approval, an estimated progress schedule indicating the starting and completion dates of the various stages of the Work, and a preliminary schedule of Shop Drawing submissions, if applicable. This provision may be waived by the Owner or Engineer.
- 2.9 Before starting the Work at the site, Contractor shall furnish Owner and Engineer certificates of insurance as required by Article 5. Within twenty (20) days after delivery of the executed Agreement by Owner to Contractor, but before starting the Work at the site, a conference will be held to review the above schedules, to establish procedures for handling Shop Drawings and other submissions and for processing Applications for Payment, and to establish a working understanding between the parties as to the Project. Present at the conference will be Owner or his representative, Engineer, Resident Project Representatives, Contractor and his Superintendent. The Owner may elect to dispense with this conference.

ARTICLE 3--CORRELATION, INTERPRETATION AND INTENT OF CONTRACT DOCUMENTS

- 3.1 It is the intent of the Contract Documents to describe the work. The work to be done under the Contract shall consist of the complete construction of each and every unit described in the plans, these General Specifications, the Construction specifications, the Special Provisions, Contract and Notice to Contractors, together with all authorized alterations. The Contractor shall furnish and provide, unless definitely and expressly stated to the contrary in the Proposal and Special Provisions or the Plans, all materials, implements, machinery, equipment, tools, supplies, transportation and labor necessary to the prosecution and completion of the Work. The work shall be scheduled to be performed on a standard Monday through Friday work week, unless otherwise approved by the Owner.
- 3.2 The Contract Documents are complementary; what is called for by one is as binding as if called for by all. If Contractor finds a conflict, error or discrepancy in the Contract Documents, he shall call it to Engineer's attention in writing at once and before proceeding with the Work affected thereby. In resolving such conflicts, errors and discrepancies, the documents shall be given precedence in the following order: Agreement, Modifications, Addenda, Specifications, and Drawings, Instructions to Bidders, Supplementary Conditions, General Conditions. Figure dimensions on Drawings shall govern over scale dimensions and detailed Drawings shall govern over general Drawings. Any work that may reasonably

be inferred from the Specifications or Drawings as being required to produce the intended result shall be supplied whether or not it is specifically called for. Work, materials or equipment described in words which so applied have a well-known technical or trade meaning shall be deemed to refer to such recognized standards.

ARTICLE 4--AVAILABILITY OF LANDS; PHYSICAL CONDITIONS; REFERENCE POINTS

AVAILABILITY OF LANDS:

- 4.1 Owner shall furnish, as indicated in the Contract Documents and not later than the date when needed by Contractor, the lands upon which the Work is to be done, rights-of-way for access thereto, and such other lands which are designated for the use of Contractor. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by Owner, unless otherwise specified in the Contract Documents. If Contractor believes that any delay in Owner's furnishing these lands or easements entitles him to an extension of the Contract Time, he may make a claim therefore as provided in Article 12.

PHYSICAL CONDITIONS--SURVEYS AND REPORTS

- 4.2 The Engineer shall provide, upon request available surveys and investigation reports of subsurface and latent physical conditions at the Project site which have been relied upon by Engineer in preparation of the Drawings and Specifications.

UNFORSEEN PHYSICAL CONDITIONS

- 4.3 Contractor shall promptly notify Owner and Engineer in writing of any subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents or anticipated in the design of the Project. Engineer will promptly investigate those conditions and advise Owner in writing if further surveys or subsurface tests are necessary. Promptly thereafter, Owner shall obtain the necessary additional surveys and tests and furnish copies to Engineer and Contractor.

REFERENCE POINTS

- 4.4 If required to perform the Work, Owner shall provide engineering surveys to establish reference points. Contractor shall be responsible for surveying and laying out the Work (unless otherwise provided), and shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of Owner. He shall report to Engineer whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations. Contractor shall replace and accurately relocate all reference points so lost, destroyed, or moved.

ARTICLE 5--BONDS AND INSURANCE

PERFORMANCE, PAYMENT AND OTHER BONDS

- 5.1 Contractor shall furnish performance and payment Bonds as security for the faithful performance and payment of all his obligations under the Contract Documents. These Bonds shall be in amounts at least equal to the Contract Price, and (except as otherwise provided) in such form and with such sureties as are licensed to conduct business in the state where the Project is located and are named in the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Federal Register by the Audit Staff Bureau of Accounts, U. S. Treasury Department, or by a Louisiana domiciled insurance company with at least an A rating in the latest printing of A. M. Best's Key Rating Guide and in accordance with Louisiana R. S. 38:2219.

The Contractor's bondsman shall obligate himself to all the terms and covenants of these specifications and of contracts covering the work executed hereunder. The Owner reserves the right to order extra work or make changes by altering, adding to or deducting from the work under the conditions and in the manner herein described without notice to the Contractor's surety and without in any manner affecting the liability of bondsman or releasing him from any of his obligations hereunder. The bond shall also secure for the Owner the faithful performance of the contract in strict accordance with plans and specifications. It shall protect the Owner against all lien laws of the State and shall provide for payment of reasonable attorney's fees for enforcement of contract and institution of concursus proceedings, if such proceedings become necessary. Likewise, it shall provide that if the Engineer is put to labor or expense by enforcement of contract and institution of concursus proceedings or through delinquency or insolvency of the contract, they shall be equitably paid for such extra expense and services involved.

The surety of the Contractor shall be and does hereby declare and acknowledge himself by acceptance to be bound to the Owner as guarantor, jointly and in solido with the Contractor, for fulfillment of terms of the foregoing conditions. The Owner reserves the right to submit to the Bonding Agent of the Contractor at any time a report of the Contractor's progress on the project. The Contractor, upon written request, may receive copies of any report sent.

- 5.2 If the surety on any Bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located is revoked, Contractor shall within five days thereafter substitute another Bond and surety, both of which shall be acceptable to Owner.

CONTRACTOR'S LIABILITY INSURANCE

- 5.3 Contractor shall purchase and maintain such insurance as will protect him from claims under workmen's compensation laws, disability benefit laws or other similar employee benefit laws; from claims for damages because of bodily injury, occupational sickness or disease, or death of his employees, and claims insured by usual personal injury liability coverage; from claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees including claims insured by usual personal injury liability coverage; and from claims for injury to or destruction of tangible property, including loss of use resulting therefrom--any or all of which may arise out of or result from Contractor's operations under the Contract Documents, whether such operations be by himself or by any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be legally liable. This insurance shall include the specific coverages and be written for not less than any limits of liability and maximum deductibles specified in the Supplementary Conditions or General Conditions or required by law, whichever is greater, shall include contractual liability insurance and shall include Owner and Engineer as additional insured parties. Before starting the work, Contractor shall file with Owner and Engineer, certificates of such insurance acceptable to Owner. These certificates shall contain a provision that should any of the policies described in the certificate be cancelled prior to the expiration date thereof, notice shall be delivered in accordance with the policy provisions. Also, the City of Slidell shall be listed as "additionally insured" on the Certificate of Insurance.

The limits of liability coverage shall not be less than the following:

Bodily injury liability of \$1,000,000 per person and \$1,000,000 per accident.

Property damage liability of \$1,000,000 per accident.

Builder's Risk in amounts at least equal to the Contract Price

Workman's Comp in the amount of \$1,000,000

OWNER'S LIABILITY INSURANCE

- 5.4 Owner shall be responsible for purchasing and maintaining his own liability insurance and, at his option, may purchase and maintain such insurance as will protect him against claims which may arise from operations under the Contract Documents.

PROPERTY INSURANCE

- 5.5 NOT USED
- 5.6 NOT USED
- 5.7 NOT USED
- 5.8 NOT USED
- 5.9 NOT USED
- 5.10 Owner and Contractor waive all rights against each other for damages caused by fire or other perils to the extent covered by insurance provided under Paragraphs 5.3 through 5.11, inclusive. Contractor shall require similar waivers by Subcontractors in accordance with Paragraph 6.12.
- 5.11 NOT USED

ADDITIONAL BONDS AND INSURANCE

- 5.12 NOT USED

ARTICLE 6--CONTRACTOR'S RESPONSIBILITIES

SUPERVISION AND SUPERINTENDENCE:

- 6.1 Contractor shall supervise and direct the Work efficiently and with his best skill and attention. He shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but he shall not be solely responsible for the negligence of others in the design or selection of a specific means, method, technique, sequence or procedure of construction which is indicated in and required by the Contract Documents. Contractor shall be responsible to see that the finished Work complies accurately with the Contract Documents.
- 6.2 Contractor shall keep on the work at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. The superintendent will be contractor's representative at the site and shall have authority to act on behalf of Contractor. All communications given to the superintendent shall be as binding as if given to Contractor.

LABOR, MATERIALS AND EQUIPMENT:

- 6.3 Contractor shall provide competent, suitably qualified personnel to survey and lay out the work, if necessary, and perform services as required by the Contract Documents. He shall at all times maintain good discipline and order at the site.
- 6.4 Contractor shall furnish all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water and sanitary facilities and all other facilities and incidentals necessary for the execution, testing, initial operation and completion of the work.
- 6.5 All materials and equipment shall be new, except as Otherwise provided in the Contract Documents. If required by Engineer, Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

If materials are brought on the work site which do not conform to the Contract Documents, the Engineer shall order the same to be removed forthwith, and in case of the neglect or refusal of the Contractor or those employed by him to remove such materials, to cause the same to be removed at the expense of the Contractor and to deduct the cost of such removal and all other expenses incidental thereto from the amount which may be due or may become due the Contractor.

- 6.6 All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator or processors, except as otherwise provided in the Contract Documents.

SUBSTITUTE MATERIALS OR EQUIPMENT:

- 6.7 If the General Conditions of the Specifications, law, ordinance, or applicable rules or regulations permit Contractor to furnish or use a substitute that is equal to any material or equipment specified, and if Contractor wishes to furnish or use a proposed substitute, he shall, prior to the conference called for by Paragraph 2.9 (unless another time is provided in the General Conditions), make written application to Engineer for approval of such a substitute certifying in writing that the proposed substitute will perform adequately the functions called for by the general design, be similar and of equal substance to that specified and be suited to the same use and capable of performing the same function as that specified; stating whether or not its incorporation in or use in connection with the Project is subject to the payment of any license fee or royalty; and identifying all variations of the proposed substitute from that specified and indicating available maintenance service. No substitute shall be ordered or installed without the written approval of Engineer who will be the judge of equality and may require Contractor to furnish such other data about the proposed substitute as he considers pertinent. No substitute shall be ordered or installed without such performance guarantee and bonds as Owner may require which shall be furnished at Contractor's expense.

CONCERNING SUBCONTRACTORS:

- 6.8 Contractor shall not employ any Subcontractor or other person or organization (including those who are to furnish the principal items of materials or equipment), whether initially or as a substitute, against whom Owner or Engineer may have reasonable objection. Use of any Subcontractor, other person or organization by Contractor shall not constitute a waiver of any right of Owner or Engineer to reject defective Work or Work not in conformance with the Contract Documents. If Owner or Engineer after due investigation has reasonable objection to any Subcontractor, other person or organization proposed by Contractor after the Notice of Award, Contractor shall submit an acceptable substitute. Contractor shall not without the consent of Owner and Engineer make any substitution for any Contractor, other person or organization who has been accepted by Owner and Engineer unless Engineer determines that there is good cause for doing so.
- 6.9 Contractor shall be fully responsible for all acts and omissions of his Subcontractors and of persons and organizations directly or indirectly employed by them and of persons and organizations for whose acts any of them may be liable to the same extent that he is responsible for the acts and omissions of persons directly employed by him. Nothing in the Contract Documents shall create any contractual relationship between Owner or Engineer and any Subcontractor or other person or organization having a direct contract with Contractor, nor shall it create any obligation on the part of Owner or Engineer to pay or to see to the payment of any monies due any Subcontractor or other person or organization, except as may otherwise be required by law. Owner or Engineer may furnish to any Subcontractor or other person or organization, to the extent practicable, evidence of

amounts paid to Contractor on account of specific Work done in accordance with the schedule of values.

- 6.10 The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or delineating the Work to be performed by any specific trade.
- 6.11 Contractor agrees to bind specifically every Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of Owner.
- 6.12 All work performed for Contractor by a Subcontractor shall be pursuant to an appropriate agreement between Contractor and the Subcontractor which shall contain provisions that waive all rights the contracting parties may have against one another for damages caused by fire or other perils covered by insurance provided in accordance with Paragraphs 5.5 through 5.11, inclusive, Contractor shall pay each Subcontractor a just share of any insurance monies received by Contractor under Paragraphs 5.5 through 5.11, inclusive.

PATENT FEES AND ROYALTIES:

- 6.13 Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents. Contractor shall indemnify and hold harmless Owner and Engineer and anyone directly or indirectly employed by either of them from and against all claims, damages, losses and expenses (including attorneys' fees) arising out of any infringement of patent rights or copyrights incident to the use in the performance of the work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents, and shall defend all such claims in connection with any alleged infringement of such rights.

PERMITS:

- 6.14 Contractor shall obtain and pay all construction permits and licenses and shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of his Bid. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall also pay all public utility charges.

LAWS AND REGULATIONS:

- 6.15 Contractor shall give all notices and comply with all laws, ordinances, rules and regulations applicable to the Work. If Contractor observes that the Specifications or Drawings are at variance therewith, he shall give Engineer prompt written notice thereof, and any necessary changes shall be adjusted by an appropriate Modification. If Contractor performs any Work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to Engineer, he shall bear all costs arising therefrom; however, it shall not be his primary responsibility to make certain that the Specifications and Drawings are in accordance with such laws, ordinances, rules and regulations.

TAXES:

- 6.16 Contractor shall pay all sales, consumer, use and other similar taxes required to be paid by him in accordance with the law of the place where the Work is to be performed.

USE OF PREMISES:

- 6.17 Contractor shall confine operations of his workmen to areas permitted by law, ordinances, permits, or the requirements of the Contract Documents.
- 6.18 Contractor shall not load nor permit any part of any structure to be loaded with weights that will endanger the structure, nor shall he subject any part of the Work to stresses or pressures that will endanger it.

RECORD DRAWINGS:

- 6.19 Contractor shall keep on record copy of all Specifications, Drawings, Addenda, Modifications, and Shop Drawings at the site in good order and annotated to show all changes made during the construction process. These shall be available to Engineer and shall be delivered to him for Owner upon completion of the Project.

SAFETY AND PROTECTION:

- 6.20 Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. He shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
- 6.20.1 All employees on the Work and other persons who may be affected thereby,
- 6.20.2 All the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and
- 6.20.3 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavement, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. He shall erect and maintain, as required by the conditions and progress of the Work, all necessary safeguards for its safety and protection. He shall notify owners of adjacent utilities when prosecution of the Work may affect them. All damages, injury or loss to any property referred to in Paragraph 6.20.2 or 6.20.3 caused, directly or indirectly, in a whole or in part, by Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall be remedied by Contractor; except damage or loss attributable to the fault of Contract Documents or to the acts or omissions of Owner or CDA or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor. Contractor's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and CDA has issued a notice to Owner and Contractor in accordance with Paragraph 14.13 that Work is acceptable and complete.

- 6.21 Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be Contractor's superintendent unless otherwise designated in writing by Contractor to Owner.

EMERGENCIES:

- 6.22 In emergencies affecting the safety of persons or the Work or property at the site or adjacent thereto, Contractor without special instruction or authorization from CDA or Owner, is obligated to act, at his discretion, to prevent threatened damage, injury or loss.

SHOP DRAWINGS AND SAMPLES:

- 6.23 After checking and verifying all field measurements, Contractor shall submit to Engineer for approval, in accordance with the accepted schedule of Shop Drawings submissions (see Paragraph 2.8), five copies (or Engineer's option, one reproducible copy) of all Shop Drawings, which shall have been checked by and stamped with the approval of Contractor and identified as Engineer may require. The data shown on the Shop Drawings will be complete with respect to dimensions, design criteria, materials of construction and the like to enable Engineer to review the information as required.
- 6.24 Contractor shall also submit to Engineer for approval with such promptness as to cause no delay in Work, all samples required by the Contract Documents. All samples will have been checked by and stamped with the approval of Contractor, identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended.
- 6.25 At the time of each submission, Contractor shall in writing call Engineer's attention to any deviations that the Shop Drawings or sample may have from the requirements of the Contract Documents.
- 6.26 Engineer will review and approve with reasonable promptness Shop Drawings and samples, but his review and approval shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The Approval of a separate item as such will not indicate approval of the assembly in which the item functions. Contractor shall make any corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and re-submit new samples until approved. Contractor shall direct specific attention in writing or on re-submitted Shop Drawings to revisions other than the corrections called for by Engineer on previous submissions. Contractor's stamp of approval on any Shop Drawing or sample shall constitute a representation to Owner and Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or he assumes full responsibility for doing so, and that he has reviewed or coordinated each Shop Drawing or sample with the requirements of the work and the Contract Documents.
- 6.27 Where a Shop Drawing or sample submission is required by the Specifications, no related Work shall be commenced until the submission has been approved by Engineer. A copy of each approved Shop Drawing and each approved sample shall be kept in good order by Contractor at the site and shall be available to Engineer.
- 6.28 Engineer's approval of Shop Drawings or sample shall not relieve Contractor from his responsibility for any deviations from the requirements of the Contract Documents, unless Contractor has in writing called Engineer's attention to such deviation at the time of submission and Engineer has given written approval to the specific deviation, nor shall any approval by Engineer relieve Contractor from responsibility for errors or omissions in the Shop Drawings.

CLEANING:

- 6.29 Contractor shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the work, and at the completion of the Work he shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, construction equipment and machinery, and surplus materials, and shall leave the site clean and ready for occupancy by Owner. Contractor shall restore to their original condition those portions of the site not designated for alteration by the Contract Documents.

INDEMNIFICATION:

- 6.30 Contractor agrees to save and hold harmless, protect, defend, and indemnify the City of Slidell, Louisiana, its officers, agents, employees and volunteers, from and against any and all claims, demands, expenses and liability arising out of injury or death to any person or the damage, loss or destruction of any property which may occur or in any way grow out of any act or omission of Contractor, its agents, servants and employees, or any and all costs, expenses and/or attorney fees incurred by City of Slidell, Louisiana as a result of any claim, demands, and/or causes of action, except those claims, demands, and/or causes of action arising out of the negligence of the City of Slidell, Louisiana, its agents, representatives, employees and volunteers. Contractor agrees to investigate, handle, respond to, provide defense for and defend any such claims, demands or suits at its sole expense and agrees to bear all other costs and expenses related thereto, even if the claim, demand or suit is groundless, false or fraudulent.
- 6.31 NOT USED
- 6.32 NOT USED

ARTICLE 7--WORK BY OTHERS

- 7.1 Owner may perform additional work related to the Project by himself, or he may let other direct contracts therefore which shall contain General Conditions similar to these. Contractor shall afford the other contractors who are parties to such direct contracts (or Owner, if he is performing the additional work himself), reasonable opportunity for the introduction and storage of materials and equipment and the execution of work, and shall properly connect and coordinate his Work with theirs.
- 7.2 If any part of Contractor's Work depends for proper execution or results upon the work of any such other contractor (or Owner), Contractor shall inspect and promptly report to Engineer in writing any defects or deficiencies in such work that render it unsuitable for such proper execution and results. His failure to so report shall constitute an acceptance of the other work as fit and proper for the relationship of his work except as to defects and deficiencies which may appear in the other work after the execution of his Work.
- 7.3 Contractor shall do all cutting, fitting, and patching of his Work that may be required to make its several parts come together properly and fit it to receive or be received by such other work. Contractor shall not endanger any work of other by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and of the other contractors whose work will be affected.
- 7.4 If the performance of additional work by other contractors or Owner is not noted in the Contract Documents prior to the execution of the contract, written notice thereof shall be given to Contractor prior to starting any such additional work.

ARTICLE 8--OWNER'S RESPONSIBILITIES

- 8.1 NOT USED
- 8.2 NOT USED
- 8.3 Owner shall furnish the data required of him under the Contract Documents promptly and shall make payments to Contractor promptly after they are due as provided in Paragraphs 14.4 and 14.13.

- 8.4 Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.1 and 4.4. Paragraph 4.2 refers to Owner's identifying and making available to Contractor copies of surveys and investigation reports of subsurface and latent physical conditions at the site or otherwise affecting performance of the work which have been relied upon by Engineer in preparing the Drawings and Specifications.
- 8.5 Owner's responsibilities in respect of liability and property insurance are set forth in Paragraph 5.4 and 5.5.
- 8.6 In addition to his rights to request changes in the Work in accordance with Article 10, Owner (especially in certain instances as provided in Paragraph 10.4) shall be obligated to execute reasonable Change Orders.
- 8.7 Owner's responsibility in respect of certain inspections, tests and approvals is set forth in Paragraph 13.2.
- 8.8 In connection with Owner's right to stop Work or suspend Work, see Paragraphs 13.8 and 15.1. Paragraph 15.2 deals with Owner's right to terminate services of Contractor under certain circumstances.

ARTICLE 9--ENGINEER'S STATUS DURING CONSTRUCTION

OWNER'S REPRESENTATIVE:

- 9.1 Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in these General Conditions and shall not be extended without written consent of Owner and Engineer.

VISITS TO SITE:

- 9.2 Engineer will make periodic visits to the site to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. He will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the work. His efforts will be directed toward providing assurance for Owner that the completed Project will conform to the requirements of the Contract Documents. On the basis of his on-site observations as an experienced and qualified design professional, he will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defects and deficiencies in the Work of contractors.

CLARIFICATIONS AND INTERPRETATIONS

- 9.3 Engineer will issue with reasonable promptness such written clarifications or interpretations of the Contract Documents (in the form of Drawings or otherwise) as he may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. If Contractor believes that a written clarification and interpretation entitles him to an increase in the Contract Price, he may make a claim therefore as provided in Article 11.

REJECTING DEFECTIVE WORK:

- 9.4 Engineer will have authority to disapprove or reject Work which is "defective" (which term is hereinafter used to describe work that is unsatisfactory, faulty or defective, or does not conform to the requirements of the Contract Documents or does not meet the requirements of any inspection, test or approval referred to in Paragraph 13.2 or has been damaged prior

to approval of final payment) as provided in Paragraph 13.7, whether or not the Work is fabricated, installed or completed.

SHOP DRAWINGS, CHANGE ORDERS AND PAYMENTS:

- 9.5 In connection with Engineer's responsibility for Shop Drawings and samples, see Paragraphs 6.23 through 6.28 inclusive.
- 9.6 In connection with Engineer's responsibility for Change Orders, see Articles 10, 11 and 12.
- 9.7 In connection with Engineer's responsibilities in respect of Applications for Payment, etc., see Article 14.

RESIDENT PROJECT REPRESENTATIVES:

- 9.8 If Owner and Engineer agree, Engineer will furnish a Resident Project Representative and assistants to assist Engineer in carrying out his responsibilities at the site. The duties, responsibilities and limitations of authority of any such Resident Project Representative and assistants shall be as set forth in an exhibit to be incorporated in the Contract Documents, (see Article 19: Supplemental Conditions).

DECISIONS ON DISAGREEMENTS:

- 9.9 Engineer will be the interpreter of the requirements of the Contract Documents and the judge of the performance thereunder. In his capacity as interpreter and judge he will exercise his best efforts to insure faithful performance by both Owner and Contractor. He will not show partiality to either and will not be liable for the result of any interpretation or decision rendered in good faith. Claims, disputes and other matters relating to the execution and progress of the Work or the interpretation of or performance under the Contract Documents shall be referred to Engineer for decision; which he will render in writing within a reasonable time. Such decisions shall be binding on the Owner and Contractor.
- 9.10 NOT USED

LIMITATIONS ON ENGINEER'S RESPONSIBILITIES:

- 9.11 Neither Engineer's authority to act under this Article 9 or elsewhere in the Contract Documents nor any decision made by him in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of Engineer to Contractor, any Subcontractor, any materialman, fabricator, supplier or any of their agents or employees or any other person performing any of the work.
- 9.12 Engineer will not be responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and he will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- 9.13 Engineer will not be responsible for the acts or omissions of Contractor, or any Subcontractors, or any of his or their agents or employees, or any other persons at the site or otherwise performing any of the Work.

ARTICLE 10--CHANGES IN THE WORK

- 10.1 The Work shall be paid according to the bid items in the Bid. If services are required to complete the Work that are not covered in the Bid, the Owner may, at his/ her discretion, without invalidating the Agreement, authorize this additional Work by written Change Order.

Upon receipt of a Change Order, Contractor shall proceed with the Work involved. All such Work shall be executed under the applicable conditions of the Contract Documents.

- 10.2 Engineer may authorize minor changes or alterations in the Work not involving extra cost and not inconsistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order.
- 10.3 Additional Work performed by Contractor without authorization of a Change Order will not entitle him to an increase in the Contract Price or an extension of the Contract Time.
- 10.4 Owner shall execute appropriate Change Orders prepared by Engineer covering changes in the Work involving work not included in the bid items in the Bid.
- 10.5 It is the Contractor's responsibility to notify his Surety of any changes affecting the general scope of the Work or change in the Contract Price and the amount of the applicable Bonds shall be adjusted accordingly.

ARTICLE 11--CHANGE OF CONTRACT PRICE

- 11.1 The Contract Price will be the sum total of lump sum price or unit prices and associated quantities in the bid, as required to perform the Work. All duties, responsibilities and obligations assigned to or undertaken by Contractor shall be included. No other compensation is available unless expressly approved by the Owner.
- 11.2 The Contract Price may only be changed by a Change Order. Any claim for an increase in the Contract Price shall be based on written notice delivered to Owner and Engineer within fifteen days of the occurrences to the event giving rise to the claim. Notice of the amount of the claim with supporting data shall be delivered within forty-five days of such occurrences unless Engineer allows an additional period of time to ascertain accurate cost data. Any change in the Contract Price resulting from any such claim shall be incorporated in a Change Order.
- 11.3 The value of any Work covered by a Change Order or any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:
 - 11.3.1 Where the Work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved.
 - 11.3.2 By mutual acceptance of a lump sum.
 - 11.3.3 On the basis of the Cost of the Work (determined as provided in Paragraphs 11.4 and 11.5) plus a Contractor's Fee for overhead and profit (determined as provided in Paragraph 11.6).

COST OF THE WORK:

- 11.4 The term Cost of the Work means the sum of all costs necessarily incurred and paid by the Contractor in the proper performance of the Work. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in Paragraph 11.5:
 - 11.4.1 Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and

Contractor. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. Such employees shall include superintendents and foremen at the site. The expenses of performing work after regular working hours (8-hour days, Monday through Friday), on Sunday or legal holidays shall be included in the above to the extent authorized by Owner.

- 11.4.2 Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and manufacturers, field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds, and all returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
- 11.4.3 Payments made by Contractor to the Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from Subcontractors acceptable to him and shall deliver such bids to Owner who will then determine with the advice of Engineer, which bids will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of Cost of Work Plus a Fee, the Cost of the Work shall be determined in accordance with Paragraphs 11.4 and 11.5. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.
- 11.4.4 Costs of special consultants (including, but not limited to, engineers, architects, testing laboratories, surveyors, lawyers and accountants) employed for services specifically related to the Work.
- 11.4.5 Supplemental costs including the following:
 - 11.4.5.1 The proportion of necessary transportation, traveling and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - 11.4.5.2 Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workmen, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of Contractor.
 - 11.4.5.3 Rentals of all construction equipment and machinery and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, installation, dismantling and removal thereof all in accordance with terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

- 11.4.5.4 Sales, use or similar taxes related to the Work, and for which Contractor is liable, imposed by any governmental authority.
- 11.4.5.5 Deposits lost for causes other than Contractor's negligence, royalty payments and fees for permits and licenses.
- 11.4.5.6 Losses, damages and expenses, not compensated by insurance or otherwise, sustained by Contractor in connection with the execution of, and to, the Work, provided they have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's Fee. If, however, any such loss or damage requires reconstruction and Contractor is placed in charge thereof, he shall be paid for his services a fee proportionate to that stated in Paragraph 11.6.2.
- 11.4.5.7 The cost of utilities, fuel and sanitary facilities at the site.
- 11.4.5.8 Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.
- 11.4.5.9 Cost of premiums for bonds and insurance which Owner is required to pay in accordance with Paragraph 5.12.

11.5 The term Cost of the Work shall not include any of the following:

- 11.5.1 Payroll costs and other compensation of Contractor's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, lawyers, auditors, accountants, purchasing and contracting agent, expeditors, timekeepers, clerks, and other personnel employed by Contractor whether at the site or in his principal or a branch office for general administration of the work and not specifically included in the schedule referred to in Subparagraph 11.4.1--all of which are to be considered administrative costs covered by the Contractor's Fee.
- 11.5.2 Expenses of Contractor's principal and branch offices other than his office at the site.
- 11.5.3 Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the work and charges against Contractor for delinquent payments.
- 11.5.4 Cost of premiums for all bonds and for all insurance policies whether or not Contractor is required by the Contract Documents to purchase and maintain the same (except as otherwise provided in Subparagraph 11.4.5.9).
- 11.5.5 Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective work, disposal of materials or equipment wrongly supplied and making good any damage to property.

11.5.6 Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 11.4.

CONTRACTOR'S FEE:

11.6 The Contractor's Fee which shall be allowed to Contractor for his overhead and profit shall be determined as follows:

11.6.1 a mutually acceptable fixed fee; or if none can be agreed upon,

11.6.2 a fee based on the following percentages of the various portions of the Cost of the Work:

11.6.2.1 for costs incurred Under Paragraphs 11.4.1 and 11.4.2, the Contractor's Fee shall be ten percent,

11.6.2.2 for costs incurred under Paragraph 11.4.3, the Contractor's Fee shall be five percent; and if a subcontract is on the basis of Cost of the Work

11.6.2.3 no fee shall be payable on the basis of costs itemized under Paragraphs 11.4.4, 11.4.5 and 11.5.

11.7 NOT USED

11.8 Whenever the cost of any Work is to be determined pursuant to Paragraphs 11.4 and 11.5, Contractor will submit in a form prescribed by Engineer an itemized cost breakdown together with supporting data.

11.9 NOT USED

ARTICLE 12 - CHANGE OF THE CONTRACT TIME

12.1 The Contract Time may only be changed by a Change Order. Any claim for an extension in the Contract Time shall be based on written notice delivered to Owner and Engineer within fifteen (15) days of the occurrence of the event giving rise to the claim. Notice of the extent of the claim with supporting data shall be delivered within forty-five (45) days of such occurrence unless Engineer allows an additional period of time to ascertain more accurate data. All claims for adjustment in the Contract Time shall be determined by Engineer if Owner and Contractor cannot otherwise agree. Any change in the Contract Time resulting from any such claim shall be incorporated in a Change Order.

12.2 The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of Contractor if he makes a claim therefore as provided in Paragraph 12.1. Such delays shall include, but not be restricted to, acts or neglect by any separate contractor employed by Owner, fires, floods, labor disputes, epidemics, abnormal weather conditions, or acts of God.

12.3 All the time limits stated in the Contract Documents are of the essence for the Agreement. The provisions of this Article 12 shall not exclude recovery for damages (including compensation for additional professional services) for delay by either party.

ARTICLE 13 - WARRANTY AND GUARANTEE; TESTS AND INSPECTIONS; CORRECTIONS, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

WARRANTY AND GUARANTEE:

- 13.1 Contractor warrants and guarantees to Owner and Engineer that all work will be of good quality in accordance with the requirements of the Contract Documents.

TESTS AND INSPECTIONS:

- 13.2 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to specifically be inspected, tested, or approved by some public body, Contractor shall assume full responsibility therefore, pay all costs in connection therewith and furnish Engineer the required certificates of inspection, testing or approval. All other inspections, tests and approvals required by the Contract Documents shall be performed by organizations acceptable to Owner and Contractor and the cost thereof shall be borne by Contractor unless otherwise specified.
- 13.3 Contractor shall give Engineer timely notice of readiness of the work for all inspections, tests or approvals. If any such Work required so to be inspected, tested or approved is covered without approval of Engineer, it must, if requested by Engineer, be uncovered for observation, and such uncovering shall be at Contractor's expense unless Contractor has given Engineer timely notice of his intention to cover such Work and Engineer has not acted with reasonable promptness in response to such notice.
- 13.4 Neither observations by Engineer nor inspections, tests or approvals by persons other than Contractor shall relieve Contractor from his obligations to perform the Work in accordance with the requirements of the Contract Documents.
- 13.5 Engineer and his representatives and other representatives of Owner will at reasonable times have access to the Work. Contractor shall provide proper and safe facilities for such access and observation of the Work and also for any inspection or testing thereof by others.

UNCOVERING WORK:

- 13.6 If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for his observation and replaced at Contractor's expense.
- 13.7 If any work has been covered which Engineer has not specifically requested to observe prior to its being covered, or if Engineer considers it necessary or advisable that covered work be inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose or otherwise make available for observation, inspection or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, Contractor shall bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, including compensation for additional professional services, and an appropriate deductive Change Order shall be issued. If, however, such Work is not found to be defective, Contractor shall be allowed an increase in the Contract price and/or extension of the Contract Time, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction if he makes a claim therefore as provided in Articles 11 and 12.

OWNER MAY STOP THE WORK:

- 13.8 If the Work is defective, or Contractor fails to supply sufficient skilled workmen or suitable materials or equipment, or if Contractor fails to make prompt payments to Subcontractors or

for labor, materials or equipment, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor or any other party.

CORRECTION OR REMOVAL OF DEFECTIVE WORK:

- 13.9 If required by Engineer prior to approval of final payment, Contractor shall promptly, without cost to Owner and as specified by Engineer, either correct any defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by Engineer, remove it from the site and replace it with acceptable Work. If Contractor does not correct such defective Work or remove and replace such rejected Work within a reasonable time, all as specified in a written notice from Engineer, Owner may have the deficiency corrected or the rejected Work removed and replaced. All direct or indirect costs of such correction or removal and replacement, including compensation for additional professional services, shall be paid by Contractor, and an appropriate deductive Change Order shall be issued. Contractor shall also bear the expenses of making good all Work of others destroyed or damaged by his correction, removal or replacement of his defective Work.

ONE-YEAR CORRECTION PERIOD:

- 13.10 If, after the approval of final payment and prior to the expiration of one year after the date of Substantial completion or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contractor Documents, any Work is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions, either correct such defective Work, or, if it has been rejected by Owner, remove it from the site and replace it with acceptable Work. If Contractor does not promptly comply with the terms of such instructions, Owner may have the defective Work corrected or the rejected work removed and replaced, and all direct and indirect costs of such removal and replacement, including compensation for additional professional services, shall be paid by Contractor.

ACCEPTANCE OF DEFECTIVE WORK:

- 13.11 If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to approval of final payment, also Engineer) prefers to accept it, he may do so. In such case, if acceptance occurs prior to approval of final payment, a Change Order shall be issued incorporating the necessary revisions in the Contract Documents, including appropriate reduction in the Contract Price; or, if the acceptance occurs after approval of final payment, an appropriate amount shall be paid by Contractor to Owner.

NEGLECTED WORK BY CONTRACTOR:

- 13.12 If Contractor should fail to prosecute the Work in accordance with the Contract Documents, including any requirements of the progress schedule, Owner, after seven days written notice to Contractor may, without prejudice to any other remedy he may have, make good such deficiencies and the cost thereof (including compensation for additional professional services) shall be charged against Contractor if Engineer approves such action, in which case a Change Order shall be issued incorporating the necessary revisions in the Contract Documents including an appropriate reduction in the Contract Price. If the payments then or thereafter due Contractor are not sufficient to cover such amount, Contractor shall pay the difference to Owner.

ARTICLE 14--PAYMENTS AND COMPLETION

SCHEDULES:

- 14.1 At least ten (10) days prior to submitting the first Application for a progress payment, Contractor shall submit a progress schedule, a final schedule of Shop Drawings submission and schedule of values of the Work. These schedules shall be satisfactory in form and substance to Engineer. The schedule of values shall include quantities and unit prices aggregating the Contractor Price, and shall subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Upon approval of the schedules of values by Engineer, it shall be incorporated into the form of Application for Payment furnished by Engineer.

APPLICATION FOR PROGRESS PAYMENT:

- 14.2 At least ten (10) days before each progress payment falls due (but not more than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such data and schedules as Engineer may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by such data, satisfactory to Owner, as will establish Owner's title to the material and equipment and protect his interest therein, including applicable insurance. Each subsequent Application for Payment shall include an affidavit of Contractor stating that all previous progress payments received on account of the work have been applied to discharge in full all of Contractor's obligations reflected in prior Applications for Payment. A retainage of 10% (ten percent) shall be withheld from each progress payment to satisfy lien claims unless the contract amount is greater than \$500,000, at which the retainage shall be 5% (five percent).

CONTRACTOR'S WARRANTY OF TITLE:

- 14.3 Contractor warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner at the time of payment free and clear of all liens, claims, security interests and encumbrances (hereafter in these General Conditions referred to as "Liens").

APPROVAL OF PAYMENTS:

- 14.4 Engineer will, within ten (10) days after receipt of each Application for Payment, either indicate in writing his approval of payment and present the Application to Owner, or return the Application to Contractor indicating in writing his reasons for refusing to approve payment. In the latter case, Contractor may make the necessary corrections and re-submit the Application. Owner shall, within thirty (30) days of presentation to him of an approved Application for Payment, pay Contractor the amount approved by Engineer.
- 14.5 Engineer's approval of any payment requested in an Application for Payment will constitute a representation by him to Owner, based on Engineer's on-site observations of the Work in progress as an experienced and qualified design professional and on his review of the Application for Payment and the accompanying data and schedules that the work has progressed to the point indicated; that, to the best of his knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning Project upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents and any qualifications stated in his approval); and that Contractor is entitled to payment of the amount approved.
- 14.6 Engineer's approval of final payment will constitute an additional representation by him, to Owner that the conditions precedent to Contractor's being entitled to final payment as set forth in Paragraph 14.13 have been fulfilled.

- 14.7 Engineer may refuse to approve the whole or any part of any payment if, in his opinion, it would be incorrect to make such representations to Owner. He may also refuse to approve any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously approved, to such extent-- as may be necessary in his opinion to protect Owner from loss because:
- 14.7.1 the Work is defective, or completed Work has been damaged requiring correction or replacement,
 - 14.7.2 claims or Liens have been filed or there is reasonable cause to believe such may be filed,
 - 14.7.3 NOT USED
 - 14.7.4 Owner has been required to correct defective Work or complete the Work in accordance with Paragraph 13.9, or
 - 14.7.5 of unsatisfactory prosecution of the Work, including failure to furnish acceptable submittals or to clean up.

SUBSTANTIAL COMPLETION:

- 14.8 Prior to final payment, Contractor may, in writing to Owner and Engineer, certify that the entire Project is substantially complete and request that Engineer issue a certificate of Substantial Completion. Within a reasonable time thereafter, Owner, Contractor and Engineer shall make an inspection of the Project to determine the status of completion. If Engineer does not consider the Project substantially complete, he will notify Contractor in writing giving his reasons therefore. If Engineer considers the Project substantially complete, he will prepare and deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion and the responsibilities between Owner and Contractor for maintenance and utilities. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment, and the certificate shall fix the time within which such items shall be completed or corrected, said time to be within the Contract Time. Written documentation that all punch list items that have been completed shall be appended to the Certificate of Substantial Completion. The costed punch list items shall be in accordance with La.R.S.38:2248(B)

Owner shall have seven days after receipt of the tentative certificate during which he may make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Project is not substantially complete, he will within fourteen (14) days after submission of the tentative certificate to Owner notify Contractor in writing, stating his reasons therefore. If, after consideration of Owner's objections, Engineer considers the Project substantially complete, he will within said fourteen (14) days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as he believes justified after consideration of any objections from Owner.

- 14.9 Owner shall have the right to exclude Contractor from the Project after date of Substantial Completion, but Owner shall allow Contractor reasonable access to complete or correct items on the tentative list.

PARTIAL UTILIZATION:

- 14.10 Prior to final payment, Owner may request Contractor in writing to permit him to use a specified part of the Project which he believes he may use without significant interference with the construction of the other parts of the Project. If Contractor agrees, he will certify to Owner and Engineer that said part of the Project is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Project to determine its status of completion. If Engineer does not consider that it is substantially complete, he will notify Owner and Contractor in writing giving his reasons therefore. If Engineer considers that part of the Project to be substantially complete, he will execute and deliver to Owner and Contractor a certificate to that effect, fixing the date of Substantial Completion as to that part of the Project, attaching thereto a tentative list of items to be completed or corrected before final payment and fixing the responsibility between Owner and Contractor for maintenance, heat and utilities as to that part of the Project. Owner shall have the right to exclude Contractor from any part of the Project which Engineer has so certified to be substantially complete, but Owner shall allow Contractor reasonable access to complete or correct items on the tentative list.

FINAL INSPECTION:

- 14.11 Upon written notice from Contractor that the Project is complete, Engineer will make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars for which this inspection reveals that the work is incomplete or defective. Contractor shall immediately take such measures as are necessary to remedy such deficiencies.

FINAL APPLICATION FOR PAYMENT:

- 14.12 After Contractor has completed all such corrections to the satisfaction of Engineer and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection and other documents--all as required by the Contract Documents, he may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by such data and schedules as Engineer may reasonably require, together with complete and legally effective releases or waivers (satisfactory to Owner) of all Liens arising out of the Contract Documents and the labor and services performed and the material and equipment furnished thereunder. In lieu thereof and as approved by Owner, Contractor may furnish receipts or releases in full; an affidavit of Contractor that the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and that all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or his property might in any way be responsible, have been paid or otherwise satisfied; and consent of the Surety, if any, to final payment. Contractor may furnish a Bond or other collateral satisfactory to Owner to indemnify him against any Lien.

APPROVAL OF FINAL PAYMENT:

- 14.13 If, on the basis of his observation and review of the Work during construction, his final inspection and his review of the final Application for Payment--all as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor has fulfilled all of his obligations under the Contract Documents, he will, within ten (10) days after receipt of the final Application for Payment, indicate in writing his approval of payment and present the Application to Owner for payment. Thereupon Engineer will give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.16. Otherwise, he will return the Application to Contractor, indicating in writing his reasons for refusing to approve final payment, in which case Contractor shall make the necessary corrections and re-submit the Application. Owner shall, within thirty (30) days of presentation to him of an approved final Application for

Payment, pay Contractor the amount approved by Engineer. Monies in retainage shall be requested as above after the lien period.

- 14.14 If after Substantial Completion of the work, final completion thereof is materially delayed through no fault of Contractor, and Engineer so confirms, Owner shall, upon certification of Engineer, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully complete or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in Paragraph 5.1, the written consent of the Surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Engineer prior to certification of such payments. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

CONTRACTOR'S CONTINUING OBLIGATION:

- 14.15 Contractor's obligation to perform the work and complete the Project in accordance with the Contract Documents shall be absolute. Neither approval of any progress or final payment by Engineer, nor the issuance of a certificate of Substantial Completion, nor any payment by Owner to Contractor under the Contract Documents, nor any use or occupancy of the Project or any failure to do so, nor any correction of defective work by Owner shall constitute an acceptance of Work not in accordance with the Contract documents.

WAIVER OF CLAIMS:

- 14.16 The making and acceptance of final payment shall constitute:

- 14.16.1 a waiver of all claims by Owner against Contractor other than those arising from unsettled Liens, defective work appearing after final inspection pursuant to Paragraph 14.11, or from failure to comply with the requirements of the Contract Documents or the terms of any special guarantees specified therein, and
- 14.16.2 a waiver of all claims by Contractor against Owner other than those previously made in writing and still unsettled.

MAINTENANCE BONDS:

- 14.17 NOT USED

- 14.18 Upon substantial completion of the Construction or Work, the Contractor at the discretion of the Engineer shall file the Engineer's Certificate of Substantial Completion with the Clerk of Courts or Recorder of Mortgages where the Contract Documents were recorded. At the expiration of 45 days, if no claims have been recorded, the Contractor shall obtain and submit to the Engineer a lien privilege certificate along with his final application for payment. Substantial completion shall be generally defined at such time as the Owner may occupy or use the Work for its intended function.

ARTICLE 15--SUSPENSION OF WORK AND TERMINATION

OWNER MAY SUSPEND WORK:

- 15.1 Owner may, at any time and without cause, suspend the work or any portion thereof for a period of not more than ninety (90) days by notice in writing to Contractor and Engineer which shall fix the date on which Work shall be resumed. Contractor shall resume the Work on the date so fixed. Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if he makes a claim therefore as provided in Articles 11 and 12.

OWNER MAY TERMINATE:

- 15.2 If Contractor is adjudged as bankrupt or insolvent, or if he makes a general assignment for the benefit of his creditors, or if a trustee or receiver is appointed for Contractor or for any of his property, or if he files a petition to take advantage of any debtor's act, or to re-organize under the bankruptcy or similar laws, or if he repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment, or if he repeatedly fails to make prompt payments to Subcontractors or for labor, or if he disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction, or if he disregards the authority of Engineer, or if he otherwise violates any provision of the Contract Documents, then Owner may, without prejudice to any other right or remedy and after giving Contractor and his Surety seven days, written notice, terminate the services of Contractor and take possession of the Project and finish the Work by whatever method he may deem expedient. In such case Contractor shall not be entitled to receive any further payment until the work is finished.
- 15.3 Where Contractor's services have been so terminated by Owner, said terminations shall not affect any right of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of monies by Owner due Contractor will not release Contractor from liability.
- 15.4 Upon seven (7) days written notice to Contractor and engineer, Owner may, without cause and without prejudice to any other right or remedy, elect to abandon the Project and terminate the Agreement. In such cases, Contractor shall be paid for all Work executed and any expense sustained plus a reasonable profit.
- 15.5 NOT USED

ARTICLE 16--ARBITRATION

- 16.1 Arbitration shall not be an acceptable method of settlement for any claim, dispute, discrepancy, deficiency, or other matter associated directly or indirectly with the work, unless specifically agreed to in writing by all parties associated with the Work.

ARTICLE 17—MISCELLANEOUS**GIVING NOTICE:**

- 17.1 Whenever any provision of the Contract Documents requires the giving of written notice, it shall be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to him who gives the notice.

COMPUTATION OF TIME:

- 17.2 When any period of time is referred to in the Contract Documents by days, it shall be commuted to include the first and the last day of such period. If the last day of any such

period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day shall be omitted from the computation.

GENERAL:

17.3 NOT USED

17.4 All Specifications, Drawings, and copies thereof furnished by Engineer shall remain his property. They shall not be used on another Project. With the exception of those sets which have been signed in connection with the execution of the Agreement, all documents shall be returned to him on request upon completion of the Project. The Contract Documents shall not be re-used or copied without the express written consent of the Engineer of record.

17.5 The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder, and, in particular but without limitations, the warranties, guarantees and obligations imposed upon Contractor by Paragraphs 6.30, 13.1, 13.10, and 14.3 and the rights and remedies available to Owner thereunder, shall be in addition to, and shall not be construed in any way as a limitation of, any rights and remedies available to them which are otherwise imposed or available by law, by special guarantee or by other provisions of the Contract Documents.

17.6 Should Owner or Contractor suffer injury or damage to his person or property because of any error, omission or act of the other or of any of his employees or agents or others for whose acts he is legally liable, claim shall be made in writing to the other party within a reasonable time of the first observance of such injury or damage.

17.7 The Contract Documents shall be governed by the law of the place of the Project.

PROJECT SIGNS:

17.8 Project signs shall be provided by the Contractor as required in the technical specifications. Any required signs shall be furnished and erected to Engineer's approval prior to any work being performed on the project. No payments shall be made if this requirement is not met. This is not a pay item.

PROJECT VIDEO:

17.9 The project area shall be videoed by the Contractor before and after the construction of the Work. This shall be copied onto a CD in a widely acceptable, readable format. The tape or copy thereof shall be provided for Owner's records.

17.10 NOT USED

ARTICLE 18--TIME FOR COMPLETION AND LIQUIDATED DAMAGES

18.1 The date of beginning and the time for completion of the work are essential conditions of the Contract Documents and the Work embraced shall be commenced on a date specified in the Notice To Proceed and completed within the time specified in the Contract Documents.

18.2 The Contractor will proceed with the work at such rate of progress to insure full completion within the Contract Time. It is expressly understood and agreed, by and between the Contractor and the Owner, that the Contract Time for the completion of the Work described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the Work.

- 18.3 If the Contractor shall fail to complete the Work within the Contract Time, or extension of time granted by the Owner, then the Contractor will pay to the Owner the amount for liquidated damages as specified in the Bid for each calendar day that the Contractor shall be in default after the time stipulated in the Contract Documents.
- 18.4 The Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the Work is due to the following, and the Contractor has promptly given Written Notice of such delay to the Owner or Engineer.
- 18.4.1 To any preference, priority or allocation order duly issued by the Owner.
- 18.4.2 To unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor, and abnormal and unforeseeable weather.

ARTICLE 19--SUPPLEMENTARY CONDITIONS

GENERAL:

Report to Bonding Company: The Owner reserves the right to submit to the Bonding Agent of the Contractor at any time a report of the Contractor's progress on the project. The Contractor, upon written request, may receive copies of any report sent.

DUTIES, RESPONSIBILITIES AND LIMITATIONS OF AUTHORITY OF RESIDENT PROJECT REPRESENTATIVE

- A. The Resident Project Representative is the Engineer's Agent, and will act as directed by and under the supervision of Engineer and will confer with the Engineer regarding his actions. The Resident Project Representative's dealings in matters pertaining to the on-site Work shall in general be only with the Engineer and the Contractor, and dealings with subcontractors shall only be through or with the full knowledge of the Contractor. Written communications with the Owner will be only through or as directed by the Engineer.
- B. Duties and Responsibilities – Resident Project Representative will:
1. Schedules: Review the progress schedule, schedule of Shop Drawing submissions and schedule of values prepared by Contractor and consult with Engineer concerning their acceptability.
 2. Conferences: Attend pre-construction conferences. Arrange a schedule of progress meetings and other job conferences as required in consultation with Engineer and notify those expected to attend in advance. Attend meetings, and maintain and circulate copies of minutes thereof.
 3. Liaison:
 - a. Serve as the Engineer's liaison with the Contractor, working principally through the Contractor's superintendent and assist him in understanding the intent of the Contract Documents. Assist the Engineer in serving as the Owner's liaison with the Contractor when the Contractor's operations affect the Owner's on-site operations.
 - b. As requested by the Engineer, assist in obtaining from the Owner additional details or information, when required at the job site for proper execution of the Work.
 4. Shop Drawings and Samples

- a. Receive and record date of receipt of Shop Drawings and samples, receive samples which are furnished at the site by Contractor, and notify Engineer of their availability for examination.
 - b. Advise Engineer and Contractor or his superintendent immediately of the commencement of any Work requiring a Shop Drawing or sample submission if the submission has not been approved by Engineer.
5. Review of Work, Rejection of Defective Work, Inspections and Tests
- a. Conduct on-site observations of the work in progress to assist Engineer in determining if the Work is proceeding in accordance with the Contract Documents and that completed Work will conform to the Contract Documents.
 - b. Report to Engineer whenever he believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents, or does not meet the requirements of any inspections, tests or approvals required to be made, or has been damaged prior to final payment; and advise Engineer when he believes Work should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.
 - c. Verify that tests, equipment and systems startups and operating and maintenance instructions are conducted as required by the Contract Documents and in presence of the required personnel, and that Contractor maintains adequate records thereof; observe, record and report to Engineer appropriate details relative to the test procedures and startups.
 - d. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the outcome of these inspections and report to Engineer.
6. Interpretation of Contract Documents: Transmit to Contractor the Engineer's clarifications and interpretations of the Contract Documents.
7. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report them with recommendations to Engineer.
8. Records
- a. Maintain at the job site orderly files for correspondence, reports of job conferences, Shop Drawings and samples submissions, reproductions of original Contract Documents including all addenda, change orders, field orders, additional Drawings issued subsequent to the execution of the Contract, Engineer's clarifications and interpretations of the Contract Documents, progress, reports, and other Project related documents.
 - b. Keep a diary or log book, recording hours on the job site, weather conditions, data relative to questions of extras or deductions, list of visiting officials and representatives of manufacturers, fabricators, suppliers and distributors, daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures. Send copies to Engineer.
 - c. Record names, addresses and telephone numbers of all Contractors, sub-contractors and major suppliers of materials and equipment.
9. Reports
- a. Furnish Engineer periodic reports as required of progress of the Work and Contractor's compliance with the approved progress schedule of Shop Drawing submissions.
 - b. Consult with Engineer in advance of scheduled major tests, inspections or start of important phases of the work.
 - c. Report immediately to Engineer upon the occurrence of any accident.

10. Payment Requisitions: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward them with recommendations to Engineer, noting particularly their relation to the schedule of values, Work completed and materials and equipment delivered at the site but not incorporated in the Work.
11. Certificates, Maintenance and operation Manuals: During the course of the Work verify that certificates, maintenance and operation manuals, and other data required to be assembled and furnished by Contractor are applicable to the items actually installed; and deliver this material to Engineer for his review and forwarding to Owner prior to final acceptance of the Work.
12. Completion
 - a. Conduct final inspection in the company of Engineer, Owner and Contractor and prepare a final list of items to be completed or corrected.
 - b. Before Engineer issues a Certificate of Completion, submit to Contractor a list of observed items requiring completion or correction.
 - c. Verify that all items on final list have been completed or corrected and make recommendations to Engineer concerning acceptance.
13. Limitations of Authority

Except upon written instructions of Engineer, Resident Project Representative:

 - a. Shall not authorize any deviation from the Contract Documents or approve any substitute materials or equipment.
 - b. Shall not exceed limitations on Engineer's authority as set forth in the contract Documents.
 - c. Shall not undertake any of the responsibilities of Contractor, subcontractors or Contractor's superintendent, or expedite the Work.
 - d. Shall not advise or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents.
 - e. Shall not advise or issue directions as to safety precautions and programs in connection with the Work.
 - f. Shall not authorize Owner to occupy the Project in whole or in part.
 - g. Shall not participate in specialized field or laboratory tests.

Randy Fandal-Mayor
250 Bouscaren Street, Suite 302
(985) 646-4270
Blaine A. Clancy, P.E., City Engineer
P.O. Box 828
Slidell, LA 70459
(985) 646-6124 FAX

PROJECT NAME

PROJECT COST



Mayor Randy Fandal

CITY COUNCIL and DISTRICTS

Bill Borchert Jr.
Jeff Burgoyne
Leslie Denham
David Dunham
Megan Haggerty
Nick DiSanti
Kenny Tamborella
Thomas "Trey" Brownfield
Cindi King

Councilman-At-Large
Councilman-At-Large
District "A"
District "B"
District "C"
District "D"
District "E"
District "F"
District "G"

TEXT	SIZES
Line 1:	3.4"
Line 2:	2.75
Line 3:	8" City Seal
Line 4:	2.5"
Line 5:	3/4"
Line 6-14:	1.25"

8'-0"

(NOTE: ALL LETTERING TO BE CENTERED)



SIGN DETAILS		
CITY OF SLIDELL ENGINEERING DEPT.		
Drawn By: STS	FILE No:	SHT 1
Approved By: BAC	DATE:	10/24/2025

SPECIAL PROVISIONS

1. Location of Work: The work to be done under this Contract Agreement is located in Slidell, Louisiana.
2. Work to be done: The work to be completed under this Agreement consists of furnishing all labor, equipment, and materials, and performing all work required as outlined below:
New two story police station and all associated site work improvements.
3. Retesting: Contractor shall pay all fees and charges incurred for retesting due to failure of initial test or other deficiencies that are the contractor's responsibility.
4. Protection of Work: Until the acceptance of the work in any "Job" by the Engineer as evidenced in writing, said work shall be under the charge and care of the Contractor. The Contractor shall take every necessary precaution against damages to any part thereof by the elements or from any other cause. The Contractor shall rebuild, restore, repair, and make good, at his own expense, all injuries or damages to any portion of the work occasioned by any of the above causes before its completion and acceptance.
5. Maintenance of Traffic: The Contractor shall provide for and maintain both through and local traffic at all times and shall conduct his operations in such manner as to cause the least possible interference with traffic at junctions with roads, streets and driveways. It shall be the Contractor's responsibility to provide suitable warning signs, rolling barricades, flagmen, etc. in order to insure maximum safety for his workmen and the public within the construction area.

In unusual situations, where traffic and physical conditions dictate, the Contractor shall install special signs, uneven pavement markers, or other specified treatment within the construction area when directed by the Engineer.

The Contractor and the Engineer will cooperate in notifying affected residents of this project, and both parties will make a concerted effort in having any parked vehicles removed from the construction area.

6. Temporary Signs and Barricades: The Contractor shall furnish, install and maintain all barricades, suitable lights, danger signals, and signs; provide watchmen; and comply with all other requirements regarding the protection of the work, workmen and safety of the public.
7. Indemnification: The Contractor agrees to indemnify, defend and save harmless the Owner and the Engineer, their consultants, agents and employees, from and against all loss or expense (including costs and attorney's fees) by reason of liability imposed by law upon the Owner and the Engineer, their consultants, agents and employees for damages because of bodily injury, including death at any time resulting therefrom, sustained by any person or persons or on account of damage to property, including loss of use thereof, arising out of or in consequence of the performance of this work, whether such injuries to person or damage to property is due or claimed to be due to the negligence of the Contractor, his subcontractors, the Owner and the Engineer, their consultants, agents and employees, except only such injury or damage as shall have been occasioned by the sole negligence of the

Owner or Engineer, and their consultants and further excepting such injury or damage due to any professional negligent act, error and omission of the Owner and Engineer, their consultants, agents and employees.

8. Clean Up: The Contractor shall at all times keep the area free from accumulations of waste material or rubbish caused by his employees or work. The Contractor shall keep all streets clean used in his operations. Trucks hauling excavated materials, cement, sand, stone, or other loose materials from or to the site shall be loaded so that no spilling will occur. Before trucks leave the site, their loads shall be carefully trimmed to prevent spillage.

The above requirements likewise apply to suppliers making deliveries to the site and the Contractor will be held responsible for compliance by his suppliers. Upon completion and before final acceptance of the work, the Contractor shall remove all false work, timbers, all surplus dirt and materials, rubbish, temporary structures, roads or drives, shall replace or renew any fences damaged and restore in an acceptable manner all property, both public and private, which may have been used or damaged in the course of construction.

9. Protection of Structures and Facilities: The Contractor shall assume full responsibility for the protection of all buildings and other structures, public and private, including tracks, pavements, curbs, sidewalks, driveways, fences, poles, power, communication lines, signs, hydrants, drainage structures, underground pipes, cables and conduits.

Wherever settlement or lateral movement of structures might occur, the Contractor shall install adequate shoring or underpinning or other means of support. Where necessary such support shall be installed in advance of construction.

10. Removal and Disposal of Water: The Contractor shall provide and maintain adequate pumping and drainage facilities for removal and disposal of water from trenches or other excavation, falsework, piling, debris or other obstructions placed during construction operations and not a part of the finished work.
11. Sanitation: The Contractor shall provide and maintain such sanitary accommodations for the use of his employees and others engaged on the project as may be necessary to comply with the requirements of the local and State health authorities and as directed by the Engineer. The Contractor shall prohibit the committing of nuisances within the work or upon lands about the work; and any employee found violating these provisions shall be removed from the project.
12. Utilities: It is the Contractors responsibility to contact Louisiana One Call to locate all utility lines. The Contractor will also be responsible for contacting all utility companies prior to construction to verify line locations.
13. Commencement, Prosecution, and Completion: The Contractor will be required to commence work at a "Job" under the contract within ten (10) calendar days after receipt by him of the Notice To Proceed for each "Job" unless otherwise agreed to by the Owner. He shall prosecute the work with faithfulness and energy and shall complete it within the number of calendar days set in the Notice to Proceed for that "Job".

SECTION 030000
CONCRETE PRE POUR INSTALLATION MEETING

PART 1 GENERAL

1.01 PRE-POUR INSTALLATION MEETING

- A. Prior to the start of the job, a pre-constriction (pre pour) meeting shall be held to define and allocate responsibilities of the entire construction team. It is the General Contractors responsibility to schedule this meeting in a timely manner prior to the first pour.
- B. Those in attendance should include, at a minimum; representatives from the Architect/Engineer, general contractor, concrete subcontractors, and concrete producer/supplier.
- C. Topics to be discussed include but are not limited to the following:
 - 1. Ensuring mix design has been approved and are in accordance with design specifications and intentions.
 - 2. Concrete installation including site access, and placement methods such as cranes, pumps, and chutes.
 - 3. Inspection responsibilities including approval of framework, rebar, finishing, curing and form stripping.
 - a. a clear expectation of finished product quality needs to be understood
 - 4. Testing frequency, responsibility and storage / retainage of test cylinders.
 - a. Distribution of and record of test reports.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 030516
UNDERSLAB VAPOR BARRIER**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Sheet vapor barrier under concrete slabs on grade.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

1.03 REFERENCE STANDARDS

- A. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2024.
- B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products.
- C. Samples: Submit samples of underslab vapor barrier to be used.
- D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Underslab Vapor Barrier:
 - 1. Water Vapor Permeance: Not more than 0.010 perms (0.6 ng/(s m² Pa)), maximum.
 - 2. Complying with ASTM E1745 Class A.
 - 3. Thickness: 15 mils (0.4 mm).
 - 4. Basis of Design:
 - a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle.
 - b. Tex-Trude; XTreme Vapor Barrier (15 mil): www.textrude.com
 - c. Raven Industries; Vaporblock VB15 (15 mil blue); www.ravenind.com.
 - d. Insulation Solutions; Viper II (15 mil blue); insulationsolutions.com.
 - e. Husky / Poly-America; Yellow Guard Vapor Barrier (15 mil): www.yellowguard.com
 - f. Substitutions: See Section 016000 - Product Requirements.
- B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.
 - 1. Seam Tape:
 - a. Water Vapor Transmission Rate: ASTM E 96, 0.3 perms or lower
 - b. Stego Industries LLC; Stego Tape Or Equal.
 - 2. Vapor Proofing Mastic:
 - a. Water Vapor Transmission Rate: ASTM E 96, 0.3 perms or lower
 - b. Stego Industries LLC; Stego Mastic Or Equal.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

- A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.
- B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

- C. Unroll vapor barrier with the longest dimension parallel with the direction of the pour.
- D. Lap joints minimum 6 inches (150 mm) and seal with manufacturer's approved tape.
- E. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.
- F. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.
- G. Repair damaged vapor retarder before covering with other materials. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6 inches minimum and taping all four sides with tape.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings, Grade Beams and Pile Caps.
 - 2. Building and Foundation walls.
 - 3. Elevated slabs.
 - 4. Concrete toppings.
 - 5. Building frame members.

1.03 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete and grout mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, and bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. De-watering System Shop Drawings: Shop drawings indicating de-watering plan and layout. Review Geo-technical Report for subgrade water table relative to work. Review local topography for water sources relative to work.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.05 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Waterstops.
 - 6. Curing compounds.
 - 7. Floor and slab treatments.
 - 8. Bonding agents.
 - 9. Adhesives.

10. Semi-rigid joint filler.
11. Joint-filler strips.
12. Repair materials.

C. Minutes of pre-installation conference.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete."
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- E. Pre-installation Conference.
 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Special Inspector / Testing agency.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semi-rigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, concrete repair procedures, and concrete protection.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Steel reinforcement shall be placed on blocking or dunnage to prevent contact with soil and water.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.
- C. Storage Box: General Contractor shall provide a wood storage box for storing standard cylinder specimens. The wood storage box shall have a wood frame made of 2x4 pine stud material. The box frame shall have a bottom and four sides. The box frame shall have a veneer of 3/4" pine plywood on the bottom and the four sides. Top of the box shall be framed of 2x4 pine stud material with 3/4" pine plywood. The top of the box shall be attached to the lower box with a minimum of two – 4" hinges. The inside clear dimensions of the box shall be a minimum of 44" long by 20" wide by 16" deep. Provide attached blocking under the bottom of the completed storage box to allow a minimum of 3 1/2" clear. The exterior of the storage box shall be painted safety orange. Label the exterior top of the storage box with white paint, 6" tall letters indicating "TESTING AGENCY USE ONLY DO NOT DISTURB". Coordinate with concrete testing agency for location of storage box to prevent damage and or disturbing cylinder specimens

PART 2 PRODUCTS

2.01 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 1. Plywood, metal, or other approved panel materials.

- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Reinforcing Bars: ASTM A722, Grade 150.
- C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- D. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.
- E. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- F. Deformed-Steel Wire: ASTM A 496/A 496M.
- G. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.
- H. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

2.03 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected bar supports.

2.04 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F or C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33. Provide aggregates from a single source.
- C. Lightweight Aggregate: ASTM C 330.
- D. Water: ASTM C 94/C 94M.

2.05 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.

- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.06 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
- B. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

2.07 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, certified by curing compound manufacturer to not interfere with bonding of floor covering.

2.08 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semi-rigid Joint Filler: Two-component, semirigid, 100 percent solids, per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.09 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 and as indicated on drawings.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Limit water-soluble, chloride-ion content in hardened concrete to percent by weight of cement as follows:
 1. Prestressed / Post-tensioned Concrete: 0.06.
 2. Concrete exposed to moisture: 0.30.
 3. Concrete protected from moisture: 1.00.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
 2. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 EXECUTION

3.01 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.

- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

- A. Utility Pipe and other penetrations. All utility piping shall be enclosed within a steel sleeve when located within concrete foundations, top of utility piping is less than 6" below concrete foundations, or the top of utility piping is less than the diameter of the utility pipe below the concrete foundation. The inside diameter of the steel sleeve shall be a minimum of 2" greater than the outside diameter of the utility pipe.
- B. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Wet sticking or placement of embedded items is not permitted.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges".

3.03 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.05 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars. Wet sticking or placement of reinforcement is not permitted.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where required.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.06 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.

3.07 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.08 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Concrete shall not be placed in water. Formwork and open trenches shall be free of standing or flowing water prior to concrete placement and during concrete placement.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleed-water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.09 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated and those to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by broom with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Slip-Resistive Finish: Before final floating, apply slip-resistive finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
 - 1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 - 2. After broadcasting and tamping, apply float finish.
 - 3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive finish.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct concrete bases to height shown and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 - 3. Minimum Compressive Strength: 4,000 psi at 28 days.
 - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete substrate.
 - 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area

- at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, pop-outs, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a Special Inspection Agency to perform field tests and inspections and prepare reports in accordance with the International Building Code, Chapter 17.
- B. Formwork Inspections:
1. Verify layout of all work for shape, location, and dimensions of concrete member being formed.
 2. Inspect erected formwork to verify that work is in accordance with formwork design, and that supports, shoring, bracing, fastenings, wedges, ties, and items are secure.
- C. Reinforcement Inspections:
1. Contractor shall notify the inspection agency providing reinforcing observation services a minimum of twenty-four (24) hours before placement of concrete so field observation of the reinforcing may be performed.
 2. Observe and inspect reinforcement in all cast-in-place concrete, excluding slabs on grade, footings without transverse reinforcement and topping slabs.
 - a. Verify reinforcing bar size and placement.
 - b. Verify reinforcing bar grade, and that bars are free of dirt, excessive rust and damage.
 - c. Verify reinforcing bars are adequately tied, chaired and supported to prevent displacement during concrete placement.

- d. Verify proper clear distances between bars and to surfaces of concrete.
 - e. Verify bar laps for proper length and stagger, and bar bends for minimum diameter, slope and length.
 - f. Verify that mechanical splices are placed in accordance with the contract Documents.
 - g. Verify all welding of reinforcing is in accordance with AWS D1.4. Verify proper joint preparation is provided and proper electrodes, properly dried and stored, are used. Verify weldability of reinforcing steel other than ASTM A706.
- D. Cast-in-Place Concrete
- 1. Concrete mix verification. Contractor shall submit approved mix design for each class of concrete to inspection agency providing prior to commencement of work.
 - a. Verify that the mixer truck trip ticket conforms to the approved design.
 - b. Verify that the total water added to the mix on site does not exceed that allowed by the concrete mix design.
 - c. Verify the concrete quality is indicative of adequate mixing time, consistency and relevant time limits.
 - 2. Inspect preparation and placement of concrete.
 - a. Verify acceptable general conditions of concrete base prior to placement.
 - b. Verify that concrete conveyance and depositing avoids segregation and contamination.
 - c. Verify that concrete is properly consolidated and reinforcement is in the proper location.
 - 3. Observe protection and curing methods for all concrete; excluding slabs on grade, strip footing without transverse reinforcement and topping slabs.
 - a. Verify that specified curing procedures are followed.
 - b. Verify that specified hot and cold weather procedures are followed.
 - 4. Inspect installation of all bolts or anchors.
 - a. Verify specified size, type, spacing, configuration, embedment and quality.
 - b. Verify proper concrete placement and consolidation around all anchors.
 - c. For post-installed anchors, verify manufacturer's installation recommendations are followed.
- E. Concrete Composite Samples: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
- 1. Compression Test Specimens: ASTM C 31/C 31M. Testing agency to determine specimen size and cast per item E.1.a OR item E.1.b.
 - a. Cast and laboratory cure one set of four standard 6x12 cylinder specimens for each composite sample. Mold and store cylinders for laboratory cured specimens.
 - b. Cast and laboratory cure one set of six standard 4x8 cylinder specimens for each composite sample. Mold and store cylinders for laboratory cured specimens.
 - 2. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture, for each 150 cu. yd. cast, or fraction thereof, or for each 5,000 square feet of wall or slab cast, whichever is more stringent.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 4. Air Entrainment: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; test first batch of air-entrained concrete and one additional test for each composite sample each day.
 - 5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 - 6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's casting of each concrete mixture.
 - 7. Compressive-Strength Tests: ASTM C 39/C 39M. Testing agency to determine specimen size and test per item E.7.a or item E.7.b.
 - a. Test one laboratory cured standard 6x12 cylinder specimen at 7 days, two at 28 days with one retained in reserve for later testing if required.

- F. Test one field-cured standard 6x12 specimens at 7 days and two at 28 days.
- G. A compressive-strength test shall be the average compressive strength from two standard 6x12 specimens obtained from same composite sample and tested at 28 days.
- H. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 - a. Test two laboratory cured standard 4x8 cylinder specimen at 7 days, three at 28 days with one retained in reserve for later testing if required.
- I. Test two field-cured standard 4x8 specimens at 7 days and three at 28 days.
- J. A compressive-strength test shall be the average compressive strength from three laboratory cured standard 4x8 specimens obtained from same composite sample and tested at 28 days.
- K. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 - a. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- 2. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- 3. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- 4. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
- 5. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 6. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION

SECTION 042200
CONCRETE UNIT MASONRY**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Mortar and self-consolidating grout.
 - 3. Steel reinforcing bars.
 - 4. Masonry joint reinforcement.
 - 5. Ties and anchors.
 - 6. Miscellaneous masonry accessories.

1.03 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Self-Consolidating Grout: highly fluid and stable grout mix not requiring consolidation or reconsolidation.
- C. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 SUBMITTALS

- A. Product Data: For each type and size of the following:
 - 1. Masonry Units
 - 2. Mortar
 - 3. Grout
 - 4. Reinforcement Steel
 - 5. Reinforcement Bar Positioners
 - 6. Joint Reinforcement
 - 7. Anchors, ties, and metal accessories
 - 8. Fabricated Flashing
- B. Material Test Certification: For each type and size of the following:
 - 1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength. Testing for each type of unit required shall be performed and dated within 180 days prior to the Notice to Proceed date.
 - 2. Mortar Test (Compressive Strength): For each mix required, according to ASTM C 780. Testing for each mix required shall be performed and dated within 180 days prior to the Notice to Proceed date.
 - 3. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019. Testing for each mix required shall be performed and dated within 180 days prior to the Notice to Proceed date.
 - 4. Grout Test (Flow – Self Consolidation): For each mix required, according to ASTM C1611. Grout shall have a spread of 26" +/- 2" for acceptance. Testing for each mix required shall be performed and dated within 180 days prior to the Notice to Proceed date.
- C. Shop Drawings (include):
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
 - 3. Reinforcing Bar Positioners. See Contract Documents for dimensional requirements.
 - 4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- D. Cold-Weather and Hot-Weather Procedures: Detailed "Plan Of Action" with description of methods, materials, and equipment to be used to comply with requirements.

1.05 QUALITY ASSURANCE

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- C. Masonry Standard: Comply with TMS 402/602 unless modified by requirements in the Contract Documents.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store concrete masonry units on elevated platforms in a dry location. If concrete masonry units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If concrete masonry units become wet, do not install until product is dry. Concrete masonry units shall be placed on blocking or dunnage to prevent contact with soil and water.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
- F. Steel Reinforcement: Deliver, store and handle steel reinforcement to prevent bending and damage. Steel reinforcement shall be placed on blocking or dunnage to prevent contact with soil or water.

1.07 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed with 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 402/602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 402/602.

PART 2 PRODUCTS**2.01 MASONRY UNITS, GENERAL**

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.02 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.
- B. CONCRETE MASONRY UNITS: ASTM C 90.
 - 1. Density Classification: Normal weight.
 - 2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
- C. Concrete Building Brick: ASTM C 55.
 - 1. Density Classification: Normal weight.

2.03 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, 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 C 207, Type S.
- C. Masonry Cement: ASTM C 91.
- D. Mortar Cement: ASTM C 1329.
- E. Aggregate for Mortar: ASTM C 144.
- F. Aggregate for Grout: ASTM C 404.
- G. Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- H. Water: Potable.

2.04 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
 - 1. Interior Walls: Mill-galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 - 3. Wire Size for Side Rods: 0.148-inch diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch diameter.
 - 5. Wire Size for Veneer Ties: 0.148-inch diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches O.C.
 - 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.05 TIES AND ANCHORS

- A. Adjustable Anchors for Connecting to Structural Steel Framing or Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

2.06 MISCELLANEOUS ANCHORS

- A. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

- B. Post-installed Anchors: Chemical anchors.
 - 1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 unless otherwise indicated.
 - 3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.07 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Reinforcing Bar Positioners: Cold-drawn steel wire conforming to ASTM A1064/A1064M. Wire positioner designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in position within cells. Wire Diameter 9 gauge (.148" or W1.7). Hot-dip galvanize after fabrication, ASTM A153/A153M-B2. Provide positioners designed for number of bars and size of bars indicated on Contract Documents. Hairpin Positioners are not permitted.

2.08 MORTAR AND GROUT 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. 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. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the type of mortar as indicated on drawings.
- C. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 3.2.1 in TMS 402/602 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 - 3. Provide grout with a flow spread of 26" +/- 2" as measured according to ASTM C1611.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- C. 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.

- D. Masonry protection, cover the top of all unfinished masonry work to protect from moisture intrusion at the conclusion of work each day and during inclement weather producing precipitation.
- E. Cold weather installation per the requirements of TMS 602, section 1.8C.
- F. Hot weather installation per the requirements of TMS 602, section 1.8D.

3.03 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 or minus 1/4 inch.
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch 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, or 1/2 inch 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, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch 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, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
- C. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
 - 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 - 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
 - 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.04 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 horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.
- E. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.

2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078400 "Firestopping."

3.05 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
- B. Lay solid 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.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.06 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 1. Place reinforcement not more than 16 inches O.C.
 2. Place reinforcement not more than 8 inches O.C. in foundation walls and parapet walls.
 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.07 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

3.08 LINTELS

- A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.09 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 402/602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 1. Comply with requirements in TMS 402/602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 56 inches.
 3. Do not vibrate self-consolidating grout.

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports in accordance with the International Building Code, Chapter 17. Contractor shall allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
- B. Mortar and Grout Verification. Contractor shall submit reviewed mix design for mortar and grout to the testing agency and the special inspection agency prior to commencement of work.
 - 1. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140, Preconstruction only.
 - 2. Mortar Test: For each mix provided, according to ASTM C 780. Provide one test per 10,000 sf of wall.
 - 3. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019. Perform test for each mix provided for each day's work or per 5,000 sf of wall whichever is greater.
 - 4. Grout Test (Flow – Self Consolidation): For each mix required, according to ASTM C1611. Grout shall have a spread of 26" +/- 2" for acceptance. Perform test for each mix provided for each day's work or per 5,000 sf of wall whichever is greater.
 - 5. Prism Test:
 - a. PRECONSTRUCTION - For each combination of components required, (Concrete Masonry Units, Mortar, and Grout), according to ASTM C1314.
 - b. Perform test for each combination of components required, (Concrete Masonry Units, Mortar, and Grout), according to ASTM C1314, per 10,000 sf of wall or fraction thereof.
- C. Masonry preparation and placement:
 - 1. Verify proportions of site-prepared mortar.
 - 2. Verify masonry bearing surfaces are clean and free of debris.
 - 3. Verify masonry units are clean, sound and dry.
 - 4. Inspect placement of masonry units for:
 - a. Nominal unit widths. Size and location of structural elements
 - b. Layup. Stack or running bond as indicated on drawings.
 - c. Thickness and tooling of mortar joints.
 - d. Acceptable depth of furrowing of bed joints.
 - e. Construction, expansion and contraction joints for location and continuity of reinforcement.
 - f. Note temperature. Verify proper application of hot and cold weather requirements.
 - g. Verify grout spaces are correctly sized and clean, cleanouts are closed after inspection and grout barriers are in place before grouting.
- D. Masonry Reinforcement:
 - 1. Inspect placement and alignment of vertical bars and dowels for size, grade, and spacing. Inspect length of lap splices, clearances between bars, clearances to masonry units and outside face of walls and positioning of reinforcement.
 - 2. Inspect horizontal joint reinforcement and masonry reinforcement bars for size, length of lap splices, dowels, clearances between bars, clearances to masonry units and outside face of walls, and alignment.
 - 3. Inspect the installation of masonry anchors, including other details of anchorage of masonry to structural members, frames or other construction, for type, size and location.
 - 4. Verify all welding of reinforcing is in accordance with AWS D1.4. Verify proper joint preparation is provided and proper electrodes, properly dried and stored, are used. Verify weldability of reinforcing steel other than ASTM A706.
- E. Verify proper grouting procedures are used, including consolidation to approved height of grout space, reconsolidation and vibration.

3.11 REPAIRING AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

- B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.12 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 042613
MASONRY VENEER**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Concrete block.
- B. Clay facing brick.
- C. Mortar and grout.
- D. Reinforcement and anchorage.
- E. Flashings.
- F. Installation of lintels.
- G. Accessories.

1.02 PRICE AND PAYMENT PROCEDURES

- A. See Section 012100 - Allowances, for cash allowances affecting this section.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018, with Editorial Revision.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019 (Reapproved 2025).
- D. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.
- E. ASTM C91/C91M - Standard Specification for Masonry Cement; 2018.
- F. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.
- G. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.
- H. ASTM C150/C150M - Standard Specification for Portland Cement; 2019a.
- I. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.
- J. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2019.
- K. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019.
- L. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.
- M. ASTM C476 - Standard Specification for Grout for Masonry; 2019.
- N. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- O. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015.
- P. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- Q. BIA Technical Notes No. 28B - Brick Veneer/Cold-Formed Steel Framed Walls; 2025.
- R. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.
- S. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories. Include instructions for handling, storage, installation, and protection..
- C. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.
- D. Duplicate samples may be required. See section 016000 Product Requirements.
- E. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- F. Shop Drawings: Provide layout, flashing, including preformed corners and end dam locations.

1.06 QUALITY ASSURANCE

- A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents and current building code requirements.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.07 MOCK-UP

- A. Construct a masonry wall as a mock-up panel sized 8 feet (2.4 m) long by 6 feet (1.8 m) high, (or higher to include all components); include mortar and accessories, structural backup, wall openings, flashings, wall insulation, and parging in mock-up.
 - 1. Flashing shall include lap joint, corner, and end dams.
 - 2. Provide in mock up all brick types (colors and shapes) and special features in pattern and insets on project/ Provide mock up with workmanship to be expected in the completed work. Obtain Architects approval of mock up before proceeding with masonry work. Completed masonry work will be compared against mock up panel for acceptance.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work upon Architects approval.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Store and handle masonry units palletized, off the ground, under cover, and in a dry location to prevent deterioration or damage due to moisture, temperature changes, contaminants, and other causes. If units become wet, do not place units until units have air dried.

PART 2 PRODUCTS

2.01 UNIT MASONRY - GENERAL

2.02 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Comply with requirements of structural Concrete Masonry Units for load bearing CMU construction.
 - 2. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depth of 8 inches (200 mm).
 - 3. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers, control joint edges, bonding, and other detailed conditions.
 - 4. Non-Loadbearing Units: ASTM C129.
 - a. Hollow block, as indicated.
 - b. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.03 BRICK UNITS

- A. Manufacturers:
 - 1. ACME Brick; www.brick.com.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Facing Brick: ASTM C216, Type FBS Smooth, Grade MW.
 - 1. Color and Texture: DTP 673 29-121-01-27 Cedar Valley.
 - 2. Nominal Size: 3 5/8 inches x 2 1/4 inches unless otherwise indicated..

3. Special Shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
 - a. For ends of sills, caps, and for similar applications indicated, unless standard units can be sawn to produce equivalent effect.
 - b. Provide special shapes for applications where shapes produced by saw cutting would result in a raw cut edge exposed to view.
4. Provide solid, uncured brick for all brick reveal areas, brick screen walls, and other areas indicated to receive solid brick on Drawings.

2.04 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91/C91M, All masonry excluding face brick use Type S cement, Face Brick use Type N Cement.
 1. Colored Mortar: Premixed cement as required to match Engineer/Architect's color sample.
 2. Manufacturers:
 - a. Or Equal
 - b. Substitutions: See Section 016000 - Product Requirements.
- B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Mortar Aggregate: ASTM C144.
- E. Grout Aggregate: ASTM C404.
- F. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
- G. Water: Clean and potable.

2.05 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 1. 1. Blok-Lok Limited: www.blok-lok.com/#sle.
 2. 2. Hohmann & Barnard, Inc; X-Seal Anchor: www.h-b.com/#sle.
 3. 3. WIRE-BOND; www.wirebond.com/#sle.
 4. 4. Substitutions: See Section 016000 - Product Requirements.
- B. Joint Reinforcement: Use ladder type joint reinforcement.
 1. Provide welded wire units pre-fabricated in straight lengths of not less than 10 feet with pre-fabricated tees and pre-fabricated corner units.
 2. Fabricate with cold drawn steel wire complying with ASTM A82 with deformed continuous side rods and plain cross rods, and a unit width of 1 1/2" to 2" less than thickness of wall or partition.
 3. Wire mesh ties will not be an acceptable substitution for welded wire pre-fabricated tees and welded wire pre-fabricated corners.
- C. Single Wythe Joint Reinforcement: Ladder type; ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3; 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage on each exposure.
 1. Fabricated with single pair of 9 gauge side rods and 9 gauge perpendicular cross rods: Hohmann & Barnard; #220 Ladder Mesh Or Equal.
- D. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch (4.8 mm) thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not less than 5/8 inch (16 mm) of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in (32 mm).
- E. Wire Mesh Ties: Use at all intersections of exterior masonry walls with interior masonry partitions and where interior masonry partitions intersect with each other, except where noted to use joint stabilizing anchors. Provide 1/2 inch mesh, 16 gage, hot dip galvanized wire mesh, 12 inches long x 1 inch less than intersection partition thickness.
 1. Hohmann & Barnard; MWT-Mesh Wall Tie Or Equal.

- F. Joint Stabilizing Anchors: Metal end piece with two integrated 9 gauge rods and a 4 inch long loose PVC "Slip Tube". Use at intersections of masonry walls at all control joint locations and where one of the intersecting masonry partitions is 8'-0" long or shorter. Install at 32 inches o.c. vertically.
 - 1. Hohmann & Barnard; Slip-Set Stabilizer Or Equal.
- G. Finish for Masonry Anchors and Ties: For interior locations, including devices that extend only into interior wythes of exterior masonry, fabricate from steel with mill galvanized finish complying with ASTM A641, Class 1 or 3; or hot dip coating complying with ASTM A 153/A153M, Class B. For devices that extend into exterior wythe, fabricate from steel with hotdip galvanized coating complying with ASTM A 153/A153M, Class B.

2.06 FLASHINGS (THRU WALL FLASHING)

- A. Provide concealed flashings shown to be built into masonry except that noted as stainless steel or other metal as specified in Division 7.
- B. Membrane Non-Asphaltic Flashing Materials:
 - 1. EPDM Flashing: ASTM D4637/D4637M, Type I, 0.040 inch (1.0 mm) thick.
 - a. Manufacturers:
 - 1) Hohmann & Barnard, Inc; TexTroflash Flashing: www.h-b.com/#sle.
 - 2) Substitutions: See Section 016000 - Product Requirements.
 - b. Refer to drawings to determine location and use of termination bar vs through wall flashing. Provide as shown on the drawings.
- C. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane, or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.
- D. Termination Bars: Stainless steel; compatible with membrane and adhesives.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc; T2 - Termination Bar: www.h-b.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. Refer to drawings to determine location and use of termination bar vs through wall flashing. Provide as shown on the drawings.

2.07 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
 - 1. Manufacturers:
 - a. Blok-Lok Limited; _____: www.blok-lok.com/#sle.
 - b. Hohmann & Barnard, Inc; _____: www.h-b.com/#sle.
 - c. WIRE-BOND; _____: www.wirebond.com/#sle.
 - d. Or Equal.
 - e. Substitutions: See Section 016000 - Product Requirements.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc; _____: www.h-b.com/#sle.
 - b. WIRE-BOND; _____: www.wirebond.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
- C. Cavity Vents:
 - 1. Type: Polyester mesh.
 - 2. Color(s): As selected by Engineer/Architect from manufacturer's full range.
 - 3. Manufacturers:
 - a. Hohmann & Barnard, Inc; QV-Quadro-Vent: www.h-b.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- D. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

1. Mortar Diverter: Panels installed at flashing locations.
 - a. Manufacturers:
 - 1) Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.
 - 2) Approved as Equal.
 - 3) Substitutions: See Section 016000 - Product Requirements.
- E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials. Cleaners containing muriatic acid will not be accepted.

2.08 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, Property Specification.
 1. Exterior, non-loadbearing masonry; Type N.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Engineer/Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- C. Grout: ASTM C476; consistency as required to fill volumes completely for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).
- D. Mixing: Use mechanical batch mixer and comply with referenced standards.
- E. Do not use air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze 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.
- F. Preblended, Dry Mortar Mix: furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions.
- G. Do not use mortar which has begun to set and discard if more than 2 1/2 hours has elapsed since initial mixing.
- H. Grout for Unit Masonry: comply with ASTM C 476.
 1. Use grout of type indicated or if not indicated of type that will comply with ACI 530 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476 for a 28 day compressive strength, but not less than 3000 psi.
 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.
- I. Mortar for Face Brick: Comply with ASTM C 270. Provide Type N mortar for all face brick.
 1. Manufacturers:
 - a. Holcim US Inc; Raindow Mortamix, www.holcim.us
 - b. Substitutions: See Section 016000 - Product Requirements.
 2. Water Repellent Admixture: Provide water repellent mortar admixture to each batch of mortar.
 - a. Grace Construction Products; DryBrick.
 - b. Or Approved Equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. 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.
- E. Provide full size units at all locations possible. Where cuts are required cut units with motor driven saws, provide clean sharp unchipped edges. Install cut units with cut surfaces concealed.

3.02 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
 - 3. Mortar Joints: Concave.
- D. Brick Units:
 - 1. Bond: Running.
 - 2. Coursing: Three units and three mortar joints to equal 8 inches (200 mm).
 - 3. Mortar Joints: Concave.

3.03 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Remove excess mortar as work progresses.
- C. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- D. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- E. Cut mortar joints flush where wall tile is scheduled, resilient base is scheduled or bitumen dampproofing is applied.
- F. Fill in solidly around built in items in masonry. Where built in items are to be embedded in cores of masonry units, place a layer of monofilament screen such as Dur-O-Wal Dur-O-Stop or equal in the joint below and rod mortar or grout into core.
- G. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.04 WEEPS/CAVITY VENTS

- A. Install weeps in veneer walls at 24 inches (600 mm) on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.
 - 1. Install a minimum of two weep hole inserts above openings less than 5'-4" wide.
 - 2. At Shelf angles extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
- B. Install cavity vents in veneer walls at 32 inches (800 mm) on center horizontally below shelf angles and lintels and at top of walls.

3.05 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents. To prevent install flashing extending from the bottom of the drainage material to at least 6 inches above the top of the drainage material.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.06 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY AND CAVITY WALL MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.

- D. D. Lap joint reinforcement ends minimum 6 inches (150 mm).

3.07 REINFORCEMENT AND ANCHORAGES - CAVITY WALL MASONRY

- A. Install horizontal joint reinforcement 16 inches (400 mm) on center.
- B. 1. Where one wythe is of clay masonry and other other of concrete masonry, use adjustable (two piece) type reinforcement with continuous horizontal scribe in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
- C. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
 - 1. Install joint stabilizing anchors not more than 32 inches on center at these locations.
- D. C. Install continuity at corners by using prefabricated L shaped units.

3.08 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted. Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, and at other obstructions.
 - 1. Prepare masonry surfaces so they are smooth and free of projections that could puncture flashing material. Where flashing is installed within mortar joint, place through wall flashing on sloping bed of mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - a. Extend flashings full width at such interruptions and at least 6 inches (152 mm), minimum, into adjacent masonry or turn up at least 1 inch (25.4 mm), minimum, to form watertight pan at non-masonry construction.
 - b. Remove or cover protrusions or sharp edges that could puncture flashings.
 - c. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.
- C. Extend EPDM flashings to within 1/4" inch (6 mm) of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.
- D. Lap end joints of flashings at least 6 inches (152 mm), minimum, and seal watertight with flashing sealant/adhesive.

3.09 LINTELS

- A. Install loose steel lintels over openings. See structural drawings for details
- B. Install reinforced unit masonry lintels over openings. See Structural Drawings for Details.

3.10 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Form expansion joint as detailed on drawings. Provide vertical expansion, control and isolation joints in masonry where indicated on Drawings. Place expansion joints not further than 25'-0" on center each way and within 5'-0" of a corner.
 - 1. Conform locations with Architect prior to installation.

3.11 BUILT IN WORK

- A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches (300 mm) from framed openings.

3.12 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).

- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm in 3 m) and 1/2 inch in 20 ft (13 mm in 6 m) or more.
- C. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm in 1 m) and 1/4 inch in 10 ft (6 mm in 3 m); 1/2 inch in 30 ft (13 mm in 9 m).
- E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).

3.13 CUTTING AND FITTING

- A. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.14 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.
- B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.
- C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.
- D. Grout Tests: Test each type of mix provided with ASTM C1019.
- E. Protection of Masonry:
 - 1. During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 2. Extend cover a minimum of 24 inches down both sides and hold cover securely in place
 - 3. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- F. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after constructing masonry walls or columns.
- G. Protect sills, ledges and projections from mortar droppings during installation.
- H. Protect surfaces of window and door frames as well as similar products with painted and integral finishes from mortar droppings and other damages.

3.15 CLEANING

- A. Remove excess mortar and mortar smears as work progresses by dry brushing before tooling joints.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.
- E. Clean exposed CMU masonry by dry brushing at the end of each day of work and after final pointing to remove mortar spots and droppings. Rub joints with carborundum or CMU block to eliminate ridges and irregularities and provide well formed intersections.
- F. Prior to cleaning brickwork:
 - 1. All cleaning methods have to be approved by Architect.
 - 2. Remove all large mortar droppings. Cleaning should begin 21 to 28 days after laying brick with Type N mortar.
 - 3. Thoroughly saturate all masonry with water before applying cleaning solution.
 - a. Use water hose with a standard hose nozzle. Apply using a circular motion at an adequate and consistent distance. Pressure Washers are **NOT** allowed as means of applying water.
 - 4. Use cleaning solution recommended by brick Manufacturer.
 - 5. Apply cleaning solution as recommended by Manufacturer.
 - 6. Do not allow cleaning chemicals to dry on brickwork.

7. Thoroughly rinse cleaning chemicals off of brickwork.
 - a. Rinse brick by starting at top of brick work and working down the wall to the ground.
 - b. Use water hose with a standard hose nozzle to rinse brick. Pressure Washers are **NOT** allowed as means of rinsing brick.

3.16 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
- B. Prevent grout or mortar from staining the face of masonry to be left exposed. Remove immediately grout or mortar in contact with such masonry.
- C. Protect installed face brick or ground face block at ground level from clay staining by maintaining a perimeter of 3'-0" wide sod as specified OR with 3'-0" wide of straw until final landscaping or other improvements indicated adjacent to completed masonry work is in place. Sod and Straw must be maintained and refreshed until permanent materials are in place.

END OF SECTION

SECTION 051200
STRUCTURAL STEEL FRAMING**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Field-installed shear connectors.
 - 3. Grout.
- B. Related Requirements:
 - 1. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
 - 2. Section 055000 "Metal Fabrications" for steel lintels, steel grating and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other steel items not defined as structural steel. Reference for hot dip galvanizing as indicated on Contract Documents.
 - 3. Section 099000 "Paints and Coatings" for surface-preparation and priming requirements.

1.03 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.04 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pre-tensioned and slip-critical, high-strength bolted connections.
- C. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data certified by the qualified professional engineer responsible for their preparation, licensed in the State of Louisiana.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.

2. Tension-control, high-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Shop primers.
5. Non-shrink grout.

F. Survey of existing conditions.

1.07 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Comply with applicable provisions of the following specifications and documents:
 1. AISC 303.
 2. AISC 341 and AISC 341s1.
 3. AISC 360.
 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 2. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents.
 1. Select and complete connections using schematic details indicated and AISC 360.
 2. Use Allowable Strength Design; data are given at service-load level.
 3. Provide a minimum of two bolts per connection or bolts required for minimum of 3/4 depth of member or indicated load, which ever is greater.
- B. Moment Connections: Type FR, fully restrained.

2.02 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M, unless noted otherwise.
- B. Channels, Angles-Shapes: ASTM A 36/A 36M, unless noted otherwise.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Hollow Structural Sections: ASTM A 500/A 500M, Grade C, structural tubing.
- E. Steel Pipe: ASTM A 500, Grade C.
- F. Welding Electrodes: Comply with AWS requirements.

2.03 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
- D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- E. Anchor Rods: ASTM F 1554, Grade as indicated.
 - 1. Configuration: Straight.
 - 2. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 5. Finish: Plain.

2.04 PRIMER

- A. Primer: SSPC-Paint 25, Type I, zinc oxide, alkyd, linseed oil primer.

2.05 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

2.06 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."
- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

2.07 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.08 SHOP PRIMING

- A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Surfaces to receive welded headed studs.
 4. Surfaces of high-strength bolted, slip-critical connections.
 5. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
1. SSPC-SP 2, "Hand Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.09 HOT-DIP GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 2. Galvanize lintels, shelf angles and all exposed structural steel framing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.03 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.04 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened, unless otherwise noted.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 2. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.05 FIELD QUALITY CONTROL

- A. Special Inspections: Testing and Inspecting: A Special Inspector shall be employed to perform inspections per Section 1704 and Section 1705 in accordance with the International Building Code. Special Inspection for structural steel shall be in accordance with the quality assurance inspection requirements of AISC 360. A Testing Agency shall be employed per Section 1703 in accordance with the International Building Code to perform field tests as required and outlined in the Contract Documents.
- B. Inspect the steel frame and joint details for compliance with the Contract Documents.
 1. Verify material identification for structural steel conform to AISC 360 criteria or other specified standards.
 2. Member placement.
 3. Application of joint details at each connection.
 4. Bracing and stiffening details.
- C. High Strength Bolting:
 1. Verify material identification of bolts, nuts and washers with specified ASTM requirements. Review manufacturer's Certificate of Compliance.
 2. Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 3. Visually inspect bolt installation for all of bolted connections for general conformance with the Contract Documents. Confirm that all plies of connected elements have been brought into contact.
 4. Test bolt tightening in ten percent (10%) of all slip critical and pre-tensioned bolts. Test a minimum of two (2) bolts in each connection. Verify that all tips are removed from "twist-off" bolts and direct tension indicators are properly installed.
- D. Welding:
 1. Verify qualifications of welders as AWS certified.
 2. Verify material identification of weld filler materials conform to AWS specifications. Review manufacturer's Certificate of Compliance
 3. Verify proper weld procedures are being applied.
 4. Verify adequate preparation of faying surfaces.
 5. Verify preheat and inter-pass temperatures of steel, proper technique and sequence of welding, cleaning and number of passes are provided as required.
 6. Visually inspect all fillet welds, plug or slot welds for size, length and quality in accordance with AWS D1.1.

7. Test 25% of all complete and partial penetration welds in accordance with the requirements of AWS D1.1 using Ultrasonic Inspection (ASTM E164). Test each root layer of all tested complete and partial penetration welds using Magnetic Particle Inspection (ASTM E709), Liquid Penetrant Inspection (ASTM E165), or another acceptable NDT procedure.
8. Shear Stud Connector welds. Inspect size, number, placement and welding of all shear connectors. Visually inspect 100% of installed studs for full 360-degree flash. Ring test all shear connectors with a 3 lb hammer. Test all questionable studs, not showing full 360-degree flash, by bending studs 15 degrees from vertical away from the weld discontinuity in accordance with AWS D1.1. Randomly test all other studs by bending to 15 degrees from vertical.
9. Miscellaneous fasteners. Visually inspect all fasteners for specified size, spacing, embedment and location.

END OF SECTION

SECTION 052100
STEEL JOIST FRAMING**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- A. Section Includes:
 - 1. K-series steel joists.
 - 2. Joist accessories.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
 - 2. Section 042000 "Unit Masonry" for installing bearing plates in unit masonry.
 - 3. Section 051200 "Structural Steel Framing" for field-welded shear connectors.

1.03 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Laboratory Test Reports for Credit EQ 4: For 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."
- C. Shop Drawings:
 - 1. Include layout, designation, number, type, location, and spacing of joists.
 - 2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
 - 3. Indicate locations and details of bearing plates to be embedded in other construction.
- D. Delegated-Design Submittal: For Steel Joist to comply with design loads, include analysis data certified by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

- A. Manufacturer certificates.
- B. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications." Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.08 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete construction.

PART 2 PRODUCTS**2.01 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
 - 1. Data are given at service-load level for gravity load and data are given at factored-load level for wind pressure.
 - 2. Design special joists to withstand design loads with live-load deflections no greater than the following:
 - a. Roof Joists: Vertical deflection of 1/360 of the span.

2.02 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- F. Do not camber joists.
- G. Camber joists according to SJI's "Specifications."
- H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.03 PRIMERS

- A. Low-Emitting Materials: Paints and coatings 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."
- B. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.04 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" or as indicated for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.
- C. Bridging: Fabricate as indicated and according to SJI's "Specifications." Furnish additional erection bridging if required for stability.
- D. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Shop prime paint.
- E. Steel bearing plates with integral anchorages are specified in Section 055000 "Metal Fabrications."

- F. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.
- G. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Plain, uncoated.
- H. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain.
- I. Welding Electrodes: Comply with AWS standards.
- J. Galvanizing Repair Paint: ASTM A 780.
- K. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.05 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.03 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

- B. Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, as applicable:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709.
 - c. Ultrasonic Testing: ASTM E 164.
 - d. Radiographic Testing: ASTM E 94.
- C. Visually inspect bolted connections.
- D. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- E. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.04 PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
 - 1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
 - 2. Apply a compatible primer of same type as primer used on adjacent surfaces.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION

**SECTION 053100
STEEL DECKING****PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Structural Steel Roof deck.
 - 2. Structural Steel Composite Floor Deck.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
 - 2. Section 05 50 00 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.04 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of steel deck.

1.05 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect Structural Sheet(s) from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack Structural Sheet(s) on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
- C. Structural Sheet(s) shall be placed on blocking or dunnage to prevent contact with soil and water.

PART 2 PRODUCTS**2.01 STEEL DECK**

- A. Structural Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck", and with the following:
 - 1. Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 50 minimum.
 - 2. Coating: G60 or G90 zinc coating or white or gray primer.
 - 3. Deck Profile, Depth, Attachment and Uncoated-Steel Thickness: As indicated.
 - 4. Span Condition: Double span minimum.
 - 5. Side Laps: Nestled overlap with connectors as indicated on the Contract Documents or interlocking seam at Contractor's option.
 - 6. Structural Sheet 36 B inch width.
- B. Structural Steel Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck", and with the following:
 - 1. Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 50 minimum.
 - 2. Coating: G60 or G90 zinc coating or white or gray primer.
 - 3. Deck Profile, Depth, Attachment and Uncoated-Steel Thickness: As indicated.

4. Span Condition: Double span (minimum).
5. Side Laps: Nestled overlapped with connectors as indicated on the Contract Documents or interlocking seam at Contractor's option.
6. Structural Sheet 36 inch width.

2.02 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10, or as indicated on the Contract Documents.
- D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 50,000 psi, not less than 0.0358-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- E. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 50,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- G. Galvanizing Repair Paint: ASTM A 780.
- H. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Install Structural Steel Roof Deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Install Structural Steel Composite Floor Deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.03 DECK INSTALLATION

- A. Fasten deck panels to steel supporting members as indicated on Contract Documents.

- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as indicated on Contract Documents, but at intervals not exceeding 1/2 of the span.
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 6 inches apart with at least one fastener at each corner.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.04 FIELD QUALITY CONTROL

- A. Testing and Inspecting: A Special Inspector shall be employed to perform inspections per Section 1704 and Section 1705 in accordance with the International Building Code. A Testing Agency shall be employed per Section 1703 in accordance with the International Building Code to perform field tests as required and outlined in the Contract Documents.
 - 1. Verify work is completed in accordance with the approved Contract Drawings and Shop Drawings in terms of;
 - a. Component placement and location.
 - b. Connection and anchorage details.
 - 2. Visually inspect 100% of the metal deck arc spot (puddle) welds for size and quality in accordance with AWS D1.1 and AWS D1.3.

3.05 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on top surface of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 055000
METAL FABRICATIONS**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Miscellaneous steel framing and supports.
 - 2. Shelf angles.
 - 3. Loose bearing and leveling plates.
 - 4. Miscellaneous Steel Trim.
 - 5. Steel weld plates and angles.
 - 6. Metal ladders.
 - 7. Metal bollards.
 - 8. Pipe guards.
 - 9. Loose steel lintels.
 - 10. Metal Bar Gratings and Treads
- B. Section 057210 "Ornamental Railings" for ornamental metal railings.

1.03 SUBMITTALS

- A. Product Data: For the following:
 - 1. Metal nosing.
 - 2. Grout.
 - 3. Metal Bar Gratings
 - 4. Metal ladders
- B. Shop Drawings: Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- C. Templates: For anchors and bolts.
- D. Samples: For each type and finish of extruded nosing.

PART 2 PRODUCTS**2.01 METALS**

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.
- B. Ferrous Metals:
 - 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 2. Steel Tubing: ASTM A 500, cold-formed steel tubing.
 - 3. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
 - 4. Metal Bar Grating: ASTM 1011/A 1011M (Bearing Bars), ASTM A 510/A 510M (Cross Bars)
- C. Nonferrous Metals:
 - 1. Aluminum Extrusions: ASTM B 221, alloy 6063-T6.
 - 2. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, alloy 6061-T6.
 - 3. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.02 FASTENERS

- A. General: Stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

- B. Cast-in-Place Anchors in Concrete (unless note otherwise): Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

2.03 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI #79.
- B. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
- C. Galvanizing Repair Paint: SSPC-Paint 20, high-zinc-dust-content paint for galvanizing welds in steel.
- D. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107.
- E. Concrete Materials and Properties: Comply with requirements in Section 03300 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.04 FABRICATION

- A. General: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
 - 1. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
 - 2. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended.
 - 3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
 - 4. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
 - 5. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 24 inches O.C.
- B. Miscellaneous Framing and Supports: Provide steel framing and supports not specified in other Sections as needed to complete the Work. Fabricate units from steel shapes, plates, and bars of welded construction. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- C. Steel Pan Stairs:
 - 1. Delegated Design: Engage a qualified professional engineer, as defined in Section 01400 "Quality Requirements," to design steel pan stairs. Qualified professional engineer shall be licensed in the State of Project.
 - 2. Construct stairs to conform to sizes and arrangements indicated on drawings; join pieces together by welding unless otherwise indicated. Provide complete stair assemblies including metal framing, hangers, column, railing, struts, clips, brackets, bearing plates, & other components necessary for support of stairs and platforms & as required to anchor and contain stairs on the supporting structure.
 - 3. The entire stairway shall surpass 100 lbs. per sq. ft. live load plus dead load.
 - 4. Stair Framing: Fabricate stringers of structural steel tubes, or plates, or a combination thereof, as indicated. Provide closure for exposed ends of stringers where applicable. Construct platforms of structural steel tube header and miscellaneous framing members as required or indicated. Bolt or weld headers to stringers, newels and framing members to stringers and headers; fabricate and join whereby bolts, if used, do not appear on finish surfaces.
 - 5. Metal Pan Riser and Sub-treads: Shape 12 gauge metal risers and sub-treads to conform to configuration as shown on drawings.
 - 6. Attach metal riser and sub-treads to stringers by direct welds, locating welds on side of metal pans to be concealed by concrete fill
 - 7. Finish paint all surfaces as indicated.
- D. Loose Steel Lintels: Fabricate loose steel lintels from steel angles and shapes of size indicated. Lintels in Exterior Walls shall be galvanized.

- E. Loose Bearing and Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts.
- F. Miscellaneous Steel Trim: Fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Exterior miscellaneous steel trim to be galvanized.
- G. Metal Ladders: Comply with ANSI A14.3, unless otherwise indicated.
 - 1. Elevator Pit Ladders: Comply with ASME A17.1.
 - 2. Space side-rails 18 inches apart, unless otherwise indicated.
 - 3. Steel Ladder Construction: Flat bar side-rails, with 3/4-inch- diameter steel bar rungs fitted in centerline of side-rails, plug-welded, and ground smooth on outer rail faces. Provide nonslip surfaces on top of each rung.
 - 4. Exterior Steel Ladders: Galvanize.
- H. Metal Bollards: Fabricate from Schedule 40 steel pipe.
 - 1. Cap bollards with 1/4-inch- thick steel plate.
 - 2. Fabricate bollards with 3/8-inch- thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
 - 3. Fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4-inch- thick steel plate welded to bottom of sleeve.
- I. Abrasive Metal Nosing.
 - 1. Cast-Metal Units: Cast gray iron or Class 20 aluminum, with an integral abrasive finish.
 - 2. Extruded Units: Aluminum, with abrasive filler in an epoxy-resin binder.
 - a. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
 - b. Provide solid-abrasive-type units without ribs.
 - 3. Provide anchors for embedding units in concrete, either integral or applied to units.
 - 4. Drill for mechanical anchors and countersink. Locate not more than 4 inches from ends and not more than 12 inches on-center.

2.05 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal fabrications after assembly.
- B. Steel and Iron Finishes:
 - 1. Hot-dip galvanize items as indicated to comply with ASTM A 123/A 123M or ASTM A 153/A 153M as applicable.
 - 2. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below for environmental exposure conditions of installed metal fabrications:
 - a. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - b. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
 - 3. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting," for shop painting.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, with edges and surfaces level, plumb, and true.
 - 1. Fit exposed connections accurately together. Weld connections that are not to be left as exposed joints but cannot be shop welded. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.
 - 2. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
 - 3. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

- B. Set bearing and leveling plates on cleaned surfaces using wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts and pack solidly with non-shrink, nonmetallic grout.
- C. Bollards:
 - 1. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch bolts at each bollard.
 - 2. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with non-shrink, nonmetallic grout.
 - 3. Fill bollards solidly with concrete, mounding top surface to shed water.
- D. Touch up surfaces and finishes after erection.
 - 1. Painted Surfaces: Clean field welds, bolted connections, and abraded areas and touch up paint with the same material as used for shop painting.
 - 2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 055100
METAL STAIRS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Stairs with concrete treads.
- B. Structural steel stair framing and supports.
- C. Handrails and guards.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.
- B. Section 033000 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2024.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.
- I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- J. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- K. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- L. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Include the design engineer's seal and signature on each sheet of shop drawings.

1.05 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

PART 2 PRODUCTS**2.01 METAL STAIRS - GENERAL**

- A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
 - 1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
 - 2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
 - 3. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.
 - 4. Dimensions: As indicated on drawings.
 - 5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 - 6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 - 7. Separate dissimilar metals using paint or permanent tape.
- B. Metal Jointing and Finish Quality Levels:
 - 1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
 - a. Welded Joints: Continuously welded and ground smooth and flush.
 - b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
 - c. Exposed Edges and Corners: Eased to small uniform radius.
 - d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.
- C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

- A. Jointing and Finish Quality Level: Architectural, as defined above.
- B. Risers: Closed.
- C. Treads: Metal pan with field-installed concrete fill.
 - 1. Concrete Depth: 1-1/2 inches (38 mm), minimum.
 - 2. Tread Pan Material: Steel sheet.
 - 3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch (1.9 mm) minimum.
 - 4. Concrete Reinforcement: Welded wire mesh.
 - 5. Concrete Finish: For resilient floor covering.
- D. Risers: Same material and thickness as tread pans.
 - 1. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.
 - 2. Nosing Depth: Not more than 1-1/2 inch (38 mm) overhang.
 - 3. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch (12 mm) wide.
- E. Stringers: Rolled steel channels.
 - 1. Stringer Depth: 10 inches (250 mm).
 - 2. End Closure: Sheet steel of same thickness as risers welded across ends.
- F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.
- G. Railings: Steel pipe railings.
- H. Finish: Shop- or factory-prime painted.
- I. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.03 HANDRAILS AND GUARDS

- A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
 - 1. Outside Diameter: 1-1/4 inch (32 mm), minimum, to 1-1/2 inches (38 mm), maximum.
- B. Guards:
 - 1. Top Rails: Round pipe or tube rails unless otherwise indicated.
 - a. Outside Diameter: 1-1/4 inch (32 mm), minimum, to 1-1/2 inches (38 mm), maximum.
 - 2. Infill at Pipe Railings: Pipe or tube rails sloped parallel to stair.
 - a. Outside Diameter: 1 inch (25 mm).
 - b. Material: Steel pipe or tube, round.
 - c. Vertical Spacing: Maximum 4 inches (100 mm) on center.
 - d. Jointing: Welded and ground smooth and flush.
 - 3. End and Intermediate Posts: Same material and size as top rails.
 - a. Horizontal Spacing: As indicated on drawings.
 - b. Mounting: Welded to top surface of stringer.

2.04 MATERIALS

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.
- C. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.
- D. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
 - 1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
 - 2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
- E. Concrete Fill: See Section 033000.
- F. Concrete Reinforcement: Mesh type as detailed, galvanized.

2.05 ACCESSORIES

- A. Factory Fabricated Stair Tread and Nosing:
 - 1. Materials: Extruded aluminum, alloy type 6063-T5, mill finish.
 - a. Tread Abrasive Filler: Virgin grain aluminum oxide epoxy-bonded to tread base.
 - b. Tread Type: Ribbed bar.
 - c. Nosing Types: Long nose for steel pan stairs.
 - d. Color: As chosen by the Architect from the manufacturer's standard colors.
 - 2. Manufacturers:
 - a. Nystrom, Inc; Inset Full Abrasive Nosing: www.nystrom.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- B. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
- C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- D. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.

2.06 SHOP FINISHING

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime Painting: Use specified shop- and touch-up primer.
 - 1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
 - 2. Number of Coats: One.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. When field welding is required, clean and strip primed steel items to bare metal.
- B. Supply items required to be cast into concrete with setting templates.

3.03 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.
- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
- F. Obtain approval prior to site cutting or creating adjustments not scheduled.
- G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

SECTION 055213.02
STEEL PIPE AND TUBE RAILINGS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. OSHA Stair railings and guardrails.
- B. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 042000 - Unit Masonry: Placement of anchors in masonry.
- C. Section 055100 - Metal Stairs: Attachment plates for handrails specified in this section.
- D. Section 092116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

1.03 REFERENCE STANDARDS

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- C. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- D. AISC 207 - Standard for Certification Programs; 2025.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- H. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.
- I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Provide a layout for all locations receiving handrails and guardrails.

1.05 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.06 QUALITY CONTROL

- A. Guardrails and Handrails shall be the product of a company normally engaged in the manufacture of pipe railing with a minimum of 10 years of documented experience.
- B. Railing shall be shop assembled in lengths not to exceed 24 feet for field erection.
- C. Components that are pop-riveted or glued at the joints will not be acceptable. All components must be mechanically fastened with stainless steel hardware.

PART 2 PRODUCTS**2.01 RAILINGS - GENERAL REQUIREMENTS**

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
- B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot (1095 N/m) applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds (890 N) applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- D. The mid-rail at a corner return shall be able to withstand a 200lb load without loosening.
- E. Allow for expansion and contraction of members and building movement without damage to connections or members.
- F. Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminations (OSHA 1910.23). The top surface of the top railing shall be smooth and shall not be interrupted by projected fittings.
- G. Dimensions:
 - 1. Vertical Posts: Maximum 6' OC Spacing
 - 2. Guardrail Height (all non stair locations): 42" AFF
 - 3. Handrail Height at Stair Locations: 34" Above the leading edge of the tread
 - 4. Top Rails and Wall Rails: 1-1/2 inches (38 mm) diameter, round.
 - 5. Intermediate Rails: 1-1/2 inches (38 mm) diameter, round. Intermediate railings shall be provided such that a 21-inch diameter sphere cannot pass through any opening.
 - 6. Intermediate Rails: 1-1/4 by 1 inch (32 by 25 mm) rectangular.
 - 7. Posts: 1-1/2 inches (38 mm) diameter, round.
 - 8. Balusters: 1/2 inch (12 mm) square solid bar.
- H. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
- I. Concrete anchors shall be stainless steel type 303 or 304 heavy duty titen screw anchors and shall be furnished by the handrail manufacturer. The anchor design shall include the appropriate reduction factors for spacing and edge distances in accordance with the manufacturers published data.
 - 1. Provide 'L' Shaped or square base plates for anchorage at corner locations where rail transistons at landings and turns. Consistncy in base plate anchorage and look is required throughout the railing run.
- J. Provide
 - 1. Provide 'L' Shaped or square base plates for anchorage at corner locations where rail transistons at landings and turns. Consistncy in base plate anchorage and look is required throughout the railing run.
 - 2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
 - 3. For anchorage to stud walls, provide backing plates, for bolting anchors.
- K. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
- B. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, black finish.
- C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- D. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

- E. Galvanizing: In accordance with requirements of ASTM A123/A123M.

2.03 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
 - 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - 2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
 - 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.
- E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- F. Continuous seal all baseplates with M-1 Universal Adhesive/Sealant or equal.
- G. Seal all roof penetrations at bolt locations with M-1 Universal Adhesive/Sealant or equal.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 061000
ROUGH CARPENTRY**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Rough opening framing for doors, windows, and roof openings.
- B. Preservative treated wood materials.
- C. Fire retardant treated wood materials.
- D. Miscellaneous framing and sheathing.
- E. Communications and electrical room mounting boards.
- F. Concealed wood blocking, nailers, and supports.
- G. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS**1.03 REFERENCE STANDARDS**

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2024.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.
- E. PS 1 - Structural Plywood; 2023.
- F. PS 2 - Performance Standard for Wood Structural Panels; 2019.
- G. PS 20 - American Softwood Lumber Standard; 2025.
- H. SPIB (GR) - Grading Rules; 2014.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation. Provide for air circulation around stacks and under coverings.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS**2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Southern Yellow Pine or Douglas Fir of following species and grades:
 - a. Structural Light Framing: Stress Group 1500 F, #2 Dense KD Grade.
 - b. Non-structural framing: Stress Group 1500 F.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

2.02 DIMENSION LUMBER

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

2.03 CONSTRUCTION PANELS

- A. Exterior Wall and Soffit Sheathing: Glass mat faced gypsum, ASTM C1177/C1177M, 5/8 inch Type X fire resistant (16 mm Type X fire resistant).
 - 1. Products:
 - a. CertainTeed Corporation; GlasRoc Brand: www.certainteed.com/#sle.
 - b. Georgia-Pacific Gypsum; DensGlass Sheathing: www.gpgypsum.com/#sle.
 - c. Approved Equal.
- B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Provide fasteners of size and type indicated that comply with requirements specified for material and manufacture.
 - 2. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 - 3. Nails, Wire, Brads, and Staples: FS FF-N-105.
 - 4. Power-Driven Fasteners: CABO NER-272.
 - 5. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.
 - 6. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - a. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Preservative Treatment:
 - 1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber exposed to weather.
 - c. Treat lumber in contact with roofing, flashing, or waterproofing.
 - d. Treat lumber in contact with masonry or concrete.
 - e. Treat lumber less than 18 inches (450 mm) above grade.
 - f. Treat lumber in other locations as indicated on the drawings.
 - 2. Preservative Pressure Treatment of Plywood/Sheathing Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention (to 4.0 kg/cu m retention).
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
 - b. Treat plywood in contact with roofing, flashing, or waterproofing.
 - c. Treat plywood in contact with masonry or concrete.
 - d. Treat plywood less than 18 inches (450 mm) above grade.
 - e. Treat plywood in other locations as indicated on the drawings.
 - 3. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.

- a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking and similar supports to allow proper attachment of other work.
- B. Select material sizes to minimize waste.
- C. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- D. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.
- E. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.
- F. Provide all framing and support members, not indicated or specified, as necessary to properly carry out all work shown and inferred by Drawings and Specifications.
- G. Spiking, nailing and bolting shall be done in an approved manner; spikes, nails, and bolts shall be of the proper size, and care shall be used so as not to split the members. Members shall be drilled accurately for bolting; and for nailing where necessary to avoid splitting. Suitable washers shall be provided under bolt head, and nuts and bolts shall be drawn up tight.
- H. Provide framing to support all edges of covering material.
- I. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
- J. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.02 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown. Build into masonry during installation of masonry work.
- C. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.
- D. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- E. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- F. Provide the following specific nonstructural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Chalkboards and marker boards.
 - 8. Wall paneling and trim.
 - 9. Joints of rigid wall coverings that occur between studs.

3.03 PLYWOOD

- A. Comply with applicable recommendations contained in Form No. E 304 APA Design/Construction Guide - Residential & Commercial for types of plywood products and applications indicated.
- B. Apply sheathing with long dimension (face grain) perpendicular to framing. Apply with side edges 1/4 inch apart and end edges 1/8 inch apart. All end edges of sheathing shall bear on a support. Stagger end joints of roof sheathing.
- C. For wood framing nail to supports with 6d common nails spaced 6 inches on center along edges and 12 inches on center at intermediate supports.
- D. Use 11 gauge galvanized roofing nails 1-3/4" long with 7/16" heads for wood framing. Fasteners shall be installed at 6" o.c. on panel edges, at 12" o.c. along intermediate supports, and 3/8" minimum from panel edge.

3.04 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.05 INSTALLATION OF CONSTRUCTION PANELS

- A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
- B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.

3.06 CLEANING

- A. Waste Disposal: See Section 017419 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 064100
ARCHITECTURAL WOOD CASEWORK**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Specially fabricated cabinet units.
- B. Solid Surface Countertops
- C. Solid Surface Window Sills
- D. Hardware.
- E. Architectural Shelving
- F. Accessories

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 088000 - Glazing: Glass for casework.
- C. Section 123600 - Countertops.

1.03 REFERENCE STANDARDS

- A. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.
- B. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- C. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Provide dimensioned plans showing location of each item, provide dimensioned elevations and large scale details, indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.
 - 2. Provide information as required by AWI.
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches (300 mm) square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.
- F. Samples: Submit actual sample items of proposed solid surface window sills, laminate wall panels, and quartz stair wall cap.
- G. Duplicate samples may be required. See section 016000 Product Requirements.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.

1.06 MOCK-UPS

- A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and accessories.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work if mock-up is acceptable.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.08 FIELD CONDITIONS

- A. Do not deliver architectural wood casework until building is fully enclosed, wet work is complete, and HVAC system is operating. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS**2.01 CABINETS**

- A. Quality Standard: Custom Grade, in accordance with AWI, unless noted otherwise.
- B. Plastic Laminate Faced Cabinets: Custom grade.
- C. Cabinets:
 - 1. Cabinet Finish and Design is as scheduled on Drawings.
 - 2. Finish - Exposed Exterior Surfaces: Decorative laminate.
 - 3. Finish - Exposed Interior Surfaces (I.E. Open Shelving): Decorative laminate.
 - 4. Finish - Concealed Surfaces (I.E. Cabinet Box Interiors): Thermoset Decorative Panels Melamine. Unless specified otherwise in the drawings.
 - 5. Finish - Drawer Sides, Backs and Bottoms: Thermoset Decorative Panels Melamine.
 - 6. Finish - Interior Shelving: Thermoset Decorative Panels Melamine.
 - 7. Door and Drawer Front Edge Profiles: Square matching laminate edge.
 - 8. Door and Drawer Front Retention Profiles: Fixed panel.
 - 9. Casework Construction Type: Type A - Frameless.
 - 10. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.

2.02 PANEL CORE MATERIALS

- A. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.
- B. Marine Plywood: a high-quality timber product composed of multiple layers of wood veneers bonded with water-resistant weather and boil proof (WBP) glue; comply with ANSI/HPVA HP-1-2020
 - 1. Locations:
 - a. Cabinet base and toe kicks- 3/4" plywood supports
 - b. Countertops where sinks are located
 - 2. Grade: Marine Grade
 - 3. Thickness: 3/4"

2.03 HARDWOOD PLYWOOD PANELS**2.04 THERMALLY FUSED LAMINATE PANELS****2.05 LAMINATE MATERIALS**

- A. Manufacturers:
 - 1. Formica Corporation: www.formica.com.
 - 2. Wilsonart; Full line of standard laminates: www.wilsonart.com.
 - 3. Or Equal.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Thermally Fused Laminate (TFL): Melamine resin, NEMA LD 3, Type VGL laminate panels.
 - 1. Manufacturers:
 - a. Wilsonart; Standard Solids: www.wilsonart.com.
 - b. Or Equal.
- C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- D. Provide specific types as follows:

1. Horizontal Surfaces: HGS, 0.048 inch (1.22 mm) nominal thickness, color as selected, finish as selected.
2. Vertical Surfaces: VGS, 0.028 inch (0.71 mm) nominal thickness, color as selected, finish as selected.
3. Laminate Backer: BKL, 0.020 inch (0.51 mm) nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.06 SOLID SURFACING

- A. Solid Surface Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
 1. Flat Sheet Thickness: 1/2 inch (12 mm), minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Dupont; <>: www.corian.com.
 - 2) Or Equal.
 - 3) Substitutions: See Section 016000 - Product Requirements.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - c. Color and Pattern: As selected by Engineer/Architect from manufacturer's standard line.
 3. Other Components Thickness: 1/2 inch (12 mm), minimum.
 4. Exposed Edge Treatment: Built up to minimum 1-1/2 inch (____ mm) thick; bullnosed edge; use marine edge at sinks.
 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches (102 mm) high.
 6. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.
- B. Solid Surface Windows Sills: Solid surfacing sheet or plastic resin casting over continuous substrate.
 1. Flat Sheet Thickness: 1/2 inch (12 mm), minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Dupont; <>: www.corian.com.
 - 2) Or Equal.
 - 3) Substitutions: See Section 016000 - Product Requirements.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - c. Color and Pattern: As selected by Engineer/Architect from manufacturer's standard line.
 3. Other Components Thickness: 1/2 inch (12 mm), minimum.
 4. Exposed Edge Treatment: <> nosing profile as indicated on drawings; <>.
 5. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.
- C. Countertops: See Section 123600 unless called for otherwise this section.
- D. Plastic Laminate Countertops: Medium density fiberboard substrate covered with HPDL, conventionally fabricated and self-edge banded. Post-formed countertops will not be accepted.

2.07 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application. Do not use adhesives that contain urea formaldehyde.
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

- D. Grommets: Standard plastic grommets for cut-outs, in color to blend with adjacent surface.
 - 1. Provide a minimum of one grommet for every 'knee space' as indicated in the millwork elevations.

2.08 HARDWARE

- A. General: Provide cabinet hardware and accessory materials associated with architectural wood casework.
- B. Hardware: BHMA A156.9, types as indicated for quality grade specified.
- C. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome or satin chrome finish, for nominal 1 inch (25 mm) spacing adjustments.
 - 1. Product: Hafele Standard and Metal Shelf Supports manufactured by Hafele America Co..
- D. Countertop Support Brackets: Fixed, L-shaped, face-of-stud mounting.
- E. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers ("U" shaped wire pull, steel with satin finish, 100 mm centers).
- F. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish. BHMA A156.11, E07121.
- G. Drawer Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish. BHMA A156.11, E07041.
- H. Glass Door Hardware:
 - 1. Hinges: CRL Geneva GEN074BSC Brushed Satin Chrome Wall Mount Short Back Plate Hinge by C.R. Laurence Co., Inc or equal. Provide three (3) per door.
 - 2. Locks: CRL Cam Locks EH98 by C.R. Laurence Co., Inc. or equal. Provide one on each door mounted at the bottom.
 - 3. Magnetic Catch: Single Automatic Magnetic Latch BP509690 as manufactured by Richelieu or equal. Provide one at the top and bottom of all doors, and coordinate location with door lock.
- I. Drawer Slides:
 - 1. Type: Full extension with overtravel.
 - 2. Static Load Capacity: Commercial grade.
 - 3. Mounting: Side mounted.
 - 4. Stops: Integral type.
 - 5. Features: Provide self closing/stay closed type.
 - 6. Manufacturers:
 - a. Hettich America, LP; Ball Bearing Slides: www.hettichamerica.com.
 - b. Knappe & Vogt Manufacturing Company; Ball Bearing Slides: www.knappeandvogt.com.
 - c. Equal As Approved.
 - d. Substitutions: See Section 016000 - Product Requirements.
- J. Hinges: European style concealed self-closing type, BHMA No. A156.9, B01602, steel with satin finish.
 - 1. Manufacturers:
 - a. Hettich America, LP; _____: www.hettich.com/#sle.
 - b. Julius Blum, Inc: www.blum.com.
 - c. Equal as Approved.
 - d. Substitutions: See Section 016000 - Product Requirements.

2.09 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings. Complete fabrication in shop to the maximum extent possible.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
 - 1. Material: Plastic Laminate to match adjacent surface and grain.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs. (Locate counter butt joints minimum 600 mm from sink cut-outs.)
- E. Provide cutouts for plumbing fixtures, inserts, outlet boxes, fixtures and fittings, and grommets. Verify locations of cutouts from on-site dimensions. Shop cut openings to maximum extent possible. Seal cut edges with a coat of varnish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. **EXPOSED FASTENERS FOR HANGING CABINET UNITS WILL NOT BE ACCEPTED.**
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.
- F. Secure counter bases to floor using appropriate angles and anchorages.
- G. Secure base cabinets to adjoining units and to back wall where walls are available.
- H. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches on center.
- I. Anchor countertops securely by screwing through corner blocks of base cabinets or other supports into underside of countertop. Caulk space between back splash and wall with sealant. Sealant color to be chosen by Architect.
- J. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
- K. Installation shall include wood furring, blocking, shims and hanging strips unless concealed within other construction before woodwork installation.
- L. Laminate Wall Panels: Anchor paneling to supporting substrate with concealed panel hanger Z clips only. Do NOT use face fastening.

3.03 ADJUSTING

- A. Adjust installed work to allow doors and drawers to fit openings properly and fully aligned.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 068316
FIBERGLASS REINFORCED PANELING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Glass fiber reinforced plastic panels (FRP).
- B. Trim.

1.02 REFERENCE STANDARDS

- A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2024.
- B. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor; 2013a.
- C. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- D. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- F. FDA Food Code - Chapter 6 - Physical Facilities; Current Edition.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Samples: Submit two samples 12 by 12 inch (____by____ mm) in size illustrating material and surface design of panels.
 - 1. Submit complete with specified applied finish.
 - 2. For selected patterns show complete pattern repeat.
 - 3. Exposed Molding and Trim: Provide samples of each type, finish, and color.
- D. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- E. Manufacturers Material Safety Data Sheets (MSDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

1.05 WARRANTY

- A. Furnish one year guarantee against defects in material and workmanship.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Fiberglass Reinforced Plastic Panels:
 - 1. Marlite, Inc; ____: www.marlite.com/#sle.
 - 2. Or Equal
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

- A. Wall Panels FRP: Location as indicated in the drawings
 - 1. Panel Size: 4 by 8 feet (1.2 by 2.4 m).
 - 2. Panel Thickness: 0.09 inch (2.3 mm).
 - 3. Surface Design: Standard FRP.

4. Color: As selected by Architect.
5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.03 MATERIALS

- A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
 1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
 2. Resistant to rot, corrosion, staining, denting, peeling, and splintering.
 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 4. Scratch Resistance: Barcol hardness score greater than 35, when tested in accordance with ASTM D2583.
 5. Water Absorption - 0.72% per ASTM D 570.
 6. Flexural Strength - 1.0 x 104 psi per ASTM D 790. (7.0 kilogram-force/square millimeter)
 7. Izod Impact Strength of 72 ft. lbs./in ASTM D 256
 8. Surface Characteristics and Cleanability: Provide products that are smooth, durable, and easily cleanable, in compliance with FDA Food Code, Chapter 6 - Physical Facilities.
- B. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.
- C. Trim: Vinyl; color coordinating with panel.
- D. Adhesive: Type recommended by panel manufacturer.
- E. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate flatness before starting work.
- B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

- A. Install panels in accordance with manufacturer's instructions.
- B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.
- C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.
- D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
- E. Install panels with manufacturer's recommended gap for panel field and corner joints.
- F. Place trim on panel before fastening edges, as required.
- G. Fill channels in trim with sealant before attaching to panel.
- H. Install trim with adhesive and screws or nails, as required.
- I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
- J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 071113
BITUMINOUS DAMPPROOFING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Bituminous dampproofing for Exterior CMU Walls.

1.02 RELATED REQUIREMENTS

- A. Section 042000 Unit Masonry
- B. Section 071900 Water Repellents

1.03 REFERENCE STANDARDS

- A. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011 (Reapproved 2023).
- B. ASTM D449/D449M - Standard Specification for Asphalt Used in Dampproofing and Waterproofing; 2003 (Reapproved 2021).
- C. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide properties of primer, bitumen, and mastics.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean dry area in accordance with manufacturer's instructions.
- C. Store at temperatures of 40oF (5oC) and above to facilitate handling.
- D. Do not store at temperatures above 90oF (32oC) for extended periods.
- E. Keep away from sparks and flames.
- F. Protect materials during handling and application to prevent damage or contamination.

1.06 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application until dampproofing has cured.
- B. Do not apply when rain is imminent.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Bituminous Dampproofing Manufacturers:
 - 1. W. R. Meadows, Inc: www.wrmeadows.com.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 BITUMINOUS DAMPPROOFING

- A. Bituminous Dampproofing (Liquid Vapor Retarder): Cold-applied water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with or without fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.
 - 1. Composition - Vertical Application: ASTM D1227 Type III or ASTM D1187 Type I.
 - 2. Composition - Horizontal and Low-Slope Application: ASTM D1227 Type III, Class 1.
 - 3. Products:
 - a. W. R. Meadows, Inc; Sealmatic Emulsion Type I (spray-grade): www.wrmeadows.com/#sle.

- b. Master Builders Solutions : Waterborne Emulsified-asphalt dampproofing compounds. Fiber free for spray application.
MasterSeal 610, 614, 615.
 - c. Substitutions: See Section 016000 - Product Requirements.
- B. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer meeting ASTM D 1227, Type III, Class 1; diluted with water as recommended by Manufacturer. Glass Fabric to meet ASTM D 1668, Type 1.

2.03 COLD ASPHALTIC MATERIALS

- A. Bitumen: Emulsified asphalt, ASTM D1227; unreinforced (Type III).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.
- C. Verify that items penetrating surfaces to receive dampproofing are securely installed.

3.02 APPLICATION

- A. Prime surfaces in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
- B. Apply dampproofing on exterior face of inner Cavity Walls. Apply one primer coat and one spray coat at not less than 1 gallon per 100 square feet..
- C. Seal items watertight with mastic, that project through dampproofing surface.
- D. Comply with Manufacturer's written recommendations unless more stringent requirements are indicated or required by project conditions.
- E. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where reinforced dampproofing is required.

3.03 PROTECTION

- A. Protect membrane with immediate application of protection course, if no drainage system is used, or rolled matrix drainage system.
- B. Backfill within 24-48 hours using care to avoid damaging the dampproofing.

END OF SECTION

SECTION 071300
SHEET WATERPROOFING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Self-adhered rubberized asphalt sheet membrane.
- B. Pre-applied mechanically attached blindside elastomeric sheet membrane.
- C. Sheet Waterproofing:

1.02 REFERENCE STANDARDS

- A. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course; 2018 (Reapproved 2022).
- B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- C. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.
- D. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2018.
- E. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test); 2008 (Reapproved 2023).
- F. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- G. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; 2022.
- H. ASTM D5385/D5385M - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes; 2025.
- I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- J. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2025).
- K. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for membrane.
- C. Manufacturer's Installation Instructions: Indicate special procedures.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 FIELD CONDITIONS

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean, dry area in accordance with manufacturer's instructions.
- C. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application and until liquid or mastic accessories have cured.
- D. Do not store at temperatures above 90o F (32o C) for extended periods.

- E. Protect materials during handling and application to prevent damage or contamination.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Product not intended for uses subject to abuse or permanent exposure to the elements.
- B. Apply membrane when conditions are dry and rain is not imminent.
- C. Ensure concrete is poured within 60 days of membrane application.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Contractor to correct defective Work within period of five years after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.
- C. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water and manufacturer agrees to replace membrane materials that fail within specified warranty period, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.01 WEATHERPROOFING APPLICATIONS

- A. Self Adhering Flashing Membrane (SAFM): Use around windows, doors, and other openings whether indicated on drawings or not, and all other areas indicated on Drawings to receive self adhering flashing membrane.
 - 1. Min Lap: 8 inches
- B. Self Adhering Weatherproofing Membrane (SAWM): Use on roof and fascia whether called for on the drawings or not. Use on wall surfaces (other than CMU) unless a weather barrier has been specified.
- C. Pre-Applied Mechanically Attached Blindside Elastomeric Sheet Membrane:
 - 1. Location: Elevator pit and other similar pit walls and under pit slabs.

2.02 SHEET WATERPROOFING MATERIALS

- A. Self Adhering Flashing Membrane (SAFM):
 - 1. 1 mm (40 mil) of self adhesive, cold applied tape consisting of 0.8 mm (32 mil) of rubberized asphalt integrally bonded to a 0.2 (8 mil) high density, cross laminated polyethylene film. membrane shall be interleaved with disposable silicone coated release paper until installed.
 - 2. Water Vapor Transmission: ASTM E 96, Method B: 0.05 perms maximum
 - 3. Water Absorption: ASTM D 570: Max 0.1% by weight
 - 4. Puncture Resistance: ASTM E 154: 80 lbs.
 - 5. Lap Peel Adhesion at minimum application temperature: ASTM D 1876: 60.0 lbs/in
 - 6. Minimum Elongation: ASTM D412 Die C 200%
 - 7. Minimum Membrane Tensile Strength: ASTM D412 modified: 1200 psi
 - 8. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
 - 9. Manufacturers:
 - a. Grace Construction Products: www.gcpat.com
 - 1) Perm-A-Barrier Wall Flashing
 - b. W.R. Meadows, Inc: www.wrmeadows.com.
 - 1) Air-Shield SMP
 - c. Substitutions: See Section 016000-Product Requirements.
- B. Self Adhering Weatherproofing Membrane (SAWM):
 - 1. 1 mm (.040 in) thick membrane comprised of 0.9 mm (0.036 in) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (.004 in) of cross-laminated, high-density polyethylene film. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
 - 2. Thickness: 1.0 mm (0.040 in.) nominal
 - 3. Tensile Strength:
 - a. Membrane: 400 pounds per square inch, minimum, measured according to ASTM D412 Method A, using die C and Min 2.7 MPa.

4. Elongation at Break: 200 percent, minimum, measured according to ASTM D412.
5. Water Vapor Permeance: 0.05 perm (2.9 ng/(Pa s sq m)), maximum, measured in accordance with ASTM E96/E96M.
6. Low Temperature Flexibility: ASTM D 1970, Unaffected to -43 degrees C (-45 degree F)
7. Lap Adhesion Strength: 5 pounds per inch (875.6 N/m), minimum, when tested according to ASTM D1876.
8. Puncture Resistance: 40 pounds (____ kg), minimum, measured in accordance with ASTM E154/E154M.
9. Water Absorption: 0.1 percent increase in weight, maximum, measured in accordance with ASTM D570.
10. Manufacturers:
 - a. Grace Construction Products as follows: <https://gcpat.com/en>
 - 1) Perm-A-Barrier Wall Membrane for masonry and concrete applications.
 - 2) Perm-A-Barrier VPS 30 Wall Membrane for sheathed applications.
 - b. W.R. Meadows, Inc.; www.wrmeadows.com
 - 1) Air-Shield SMP for use on precast concrete, cast-in-place concrete, masonry (concrete block), interior and exterior gypsum, board, Styrofoam, primed steel, aluminum mill finish, anodized aluminum, primed galvanized metal, drywall, and plywood
 - c. Substitutions: See Section 016000-Product Requirements.
- C. Pre-Applied Mechanically Attached Blindside Elastomeric Sheet Waterproofing: Composite membrane of elastomeric materials bonded to proprietary inner core and carrier sheet, recommended by manufacturer for direct concrete contact for vertical and horizontal applications.
 1. Membrane Thickness: 73 mil, 0.073 inch (1.85 mm), minimum.
 2. Low Temperature Flexibility, ASTM D1970/D1970M: Pass.
 3. Hydrostatic Pressure Resistance: Membrane resists leakage for at least one hour from pressure equivalent to 231 feet (70.4 m) head of water applied in accordance with test method ASTM D5385/D5385M.
 4. Elongation, ASTM D412: Greater than 400 percent.
 5. Tensile Strength (film), ASTM D882: 9,200 psi (63.4 MPa).
 6. Crack Cycling, ASTM C836/C836M: Pass.
 7. Adhesion: 150 psi (1.03 MPa), minimum, measured in accordance with ASTM D4541.
 8. Water Vapor Transmission, ASTM E96/E96M (Water Method): 0.0011 perm (0.06 ng/(Pa s sq m)).
 9. Resistance to Penetration by Pesticides: Zero percent.
 10. Adhesives, Sealants, Tapes and Accessories: As recommended by membrane manufacturer
 11. Products:
 - a. W. R. Meadows, Inc; PRECON WG: www.wrmeadows.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- D. Termination Mastic: Ruberized asphalt based mastic as recommended by membrane manufacturer.
- E. Surface Conditioner: latex based, water-dispersible liquid type, compatible with membrane.

2.03 ACCESSORIES

- A. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions are acceptable prior to starting work.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

3.02 PREPARATION

- A. Protect adjacent surfaces from damage not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions. Remove debris or any other foreign material that could damage the membrane.

- C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
- D. Fill nonmoving joints and cracks with a filler compatible with waterproofing materials.
- E. Inspect all surfaces for any conditions detrimental to the proper completion of the work.
- F. Ensures surfaces are structurally sound.

3.03 INSTALLATION - PIT MEMBRANE

- A. Vertical Ap
 - 1. Install the membrane with the fabric side facing the interior side of the form to receive the concrete.
 - 2. Mechanically fasten membrane across the top lagging at 12" (310 mm) on center, ½" (12 mm) from the top, with fasteners approved by the manufacturer.
 - 3. Apply liquid membrane over the areas where the fasteners have been attached and carry over the top edge.
 - 4. Remove release paper on 6" (152.4 mm) factory edge.
 - 5. Mechanically fasten membrane vertically, 24" (620 mm) on center, into the exposed factory edge of the membrane if vertical fastening is required.
 - 6. Install subsequent sheet of membrane and overlap onto the 6" (152.4 mm) factory edge and roll press into place.
 - 7. For end-to-end overlap, overlap membrane 6" (152.4 mm).
 - 8. Apply liquid detail membrane in this area to be lapped and roll press membrane into this liquid detail membrane.
 - 9. Apply liquid detail membrane at terminations of membrane, 12" (310 mm) wide centered over the termination.
 - 10. Embed detail fabric into this wet liquid detail membrane centered over the termination, 6" (152.4 mm) on each side of lap edge, and roll press into place.
 - 11. Apply additional liquid detail membrane on all terminations of detail fabric.
 - 12. Inspect membrane prior to pouring of concrete for any punctures or damage.
 - 13. Repair damaged areas as directed by the manufacturer.
- B. Horizontal Application
 - 1. Prepare subgrade prior to membrane application according to ACI 302.1R.17.
 - 2. Ensure the fabric side of the membrane is facing up.
 - 3. Remove release paper on 6" (152.4 mm) selvedge edge and overlap edges of additional sheet. Roll press into place.
 - 4. For end-to-end overlap, overlap membrane 6" (152.4 mm).
 - 5. Apply liquid detail membrane in this area to be lapped and roll press membrane into this liquid detail membrane.
 - 6. Apply liquid detail membrane at terminations of membrane, 12" (310 mm) wide centered over the termination.
 - 7. Embed detail fabric into this wet liquid detail membrane centered over the termination, 6" (152.4 mm) on each side of lap edge, and roll press into place.
 - 8. Apply additional liquid detail membrane on all terminations of detail fabric.
 - 9. Inspect membrane prior to pouring of concrete for any punctures or damage.
 - 10. Repair damaged areas as directed by the manufacturer.

3.04 INSTALLATION - SELF ADHERING MEMBRANE

- A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
- B. Roll out membrane, and minimize wrinkles and bubbles.
- C. Self-Adhering Membrane: Remove release paper layer, and roll out onto substrate with a mechanical roller to provide full contact bond.
 - 1. Install as thru-wall water stop in exterior walls above and around all openings, at all breaks in masonry back-up, at wall base, and all other locations indicated on Drawings.
 - 2. All surfaces to receive the flashing shall be reasonably smooth, free from irregularities and deleterious materials. On all horizontal surfaces the flashing shall be laid either in a fresh bed of

- mortar above and below or a trowel coat of mastic. Vertical surfaces shall be pressed firmly in place by hand roller.
3. Flashing shall start at the outside toe of the shelf angle, go up the face of the beam and through the wall turning up on the inside face of the wall not less than 2" and be secured with a metal termination bar and sealant.
 4. Flashing shall start ½" from outside face of wall, then through the wall turning up at the inside not less than 6" and extend 6" on each side of the opening. It shall be turned at the ends forming a 2" deep pan running entirely through the wall. Flashing shall be secured with a metal termination bar and sealant.
 5. Flashing shall start ½" from the outside face of wall, then go through wall turning up at the inside not less than 2" and be secured with a metal termination bar and sealant.
 6. Joints: The material shall be lapped at least 2" and rolled with a steel hand roller.
- D. Overlap edges and ends, minimum 3 inches (76 mm), seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.
 - E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
 - F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.
 - G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.
 - H. Seal membrane and flashings to adjoining surfaces.

3.05 PROTECTION

- A. Do not permit traffic over unprotected or uncovered membrane.
- B. Protect membranes from damage by other trades or construction materials.
- C. Ensure membrane is not damaged prior to concrete pour.
- D. Ensure concrete is poured within 60 days of membrane application.

END OF SECTION

SECTION 071616
CRYSTALLINE WATERPROOFING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Crystalline waterproofing.
- B. Preparation of surfaces.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete to be waterproofed.

1.03 REFERENCE STANDARDS

- A. COE CRD-C 48 - Handbook for Concrete and Cement Standard Test Method for Water Permeability of Concrete; 1992.
- A. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- A. UL (DIR) - Online Certifications Directory; Current Edition.
- B. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Test data showing hydraulic permeability.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
 - 5. Details for waterproofing at joints, intersections, and other special conditions.
- C. Manufacturer's qualification statement.
 - 1. Precautions for curing and filling water holding structures.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience and providing technical representative to visit project site.
- B. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Take necessary precautions to keep cementitious materials dry.

1.07 FIELD CONDITIONS

- A. Maintain environmental conditions, such as temperature, humidity, and ventilation within limits recommended by manufacturer for acceptable results; do not install products under environmental conditions outside the manufacturer's indicated limits.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Crystalline Waterproofing:
 - 1. Xypex Chemical Corporation; Xypex Concentrate: www.xypex.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 ASSEMBLIES

- A. Crystalline Waterproofing for Concrete Building Surfaces:

2.03 MATERIALS

- A. Crystalline Waterproofing: Portland cement, quartz or silica sand, and other active chemicals that when applied to surface of concrete forms insoluble crystals in capillary pores preventing passage of liquids, while having no adverse effect on normal properties of concrete.
 - 1. Water Permeability of Applied Concrete: No measurable leakage or water flow at pressure ranging from 175 psi (1.21 MPa) to 200 psi (1.38 MPa) when tested in accordance with COE CRD-C 48, using at least 2-inch (51 mm) thick sample, and with applied surface preparation and installation in accordance with NRCA (WM).
 - 2. Toxicity: Non-toxic.
 - a. Potable Water and Drinking Water Safe: Provide UL (DIR) listed and labeled waterproofing; tested to be safe for use in potable and drinking water applications in accordance with NSF 61.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Engineer/Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under project conditions, and consider use of sandblasting, water blasting, or acid etching as recommended.
- C. Plug water leaks.
- D. Patch holes, construction joints, and cracks; remove defective concrete.
- E. Obtain approval of manufacturer's field representative before beginning installation.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's written instructions, maintain environmental conditions required and recommended by manufacturer, and keep a copy of manufacturer's instructions on site.
- B. Coordinate waterproofing installation with installation of products that must penetrate waterproofed surfaces.
- C. Prevent excessive drying of surface.
 - 1. Cure waterproofing for at least three days, or length of time required by manufacturer, with water spray and adequate air circulation.
 - 2. Do not use chemical curing agents unless explicitly approved by waterproofing manufacturer.
- D. Do not backfill, fill water or liquid holding structures, or apply finish coatings until time period recommended by manufacturer has passed.

3.04 PROTECTION

- A. Protect from damage by weather; do not cover with vapor impermeable sheathing or films unless air circulation is provided.
- B. Touch-up, repair or replace damaged waterproofing after Date of Substantial Completion.

END OF SECTION

SECTION 071900
WATER REPELLENTS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Water repellents applied to exterior masonry vertical surfaces.

1.02 REFERENCE STANDARDS

- A. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2018a.
- B. ASTM D5095 - Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments; 1991 (Reapproved 2022).

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, details of tests performed, limitations, chemical composition, and _____.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience
- C. Manufacturer's Field Service: Engage a factory authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

1.05 MOCK-UPS

- A. Prepare representative surface 36 by 36 inches (0.91 by 0.91 m) in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.
- B. Locate where directed.
- C. Mock-up may remain as part of work.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Silane, Siloxane, Silane-Siloxane Blend, and Siliconate Water Repellents:
 - 1. Master Builders Solutions; [____]: www.master-builders-solutions.com.
 - 2. PROSOCO, Inc; ____: www.prosoco.com/#sle.
 - 3. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

- A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
 - 1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
 - 2. Number of Coats: Two.
 - 3. VOC Content: Less than 600 g/L, when tested in accordance with ASTM D3960 or ASTM D5095.
 - 4. Silane, siloxane, silane-siloxane blend, or siliconate that reacts chemically with concrete and masonry.
 - a. Manufacturers:
 - 1) Master Builders Solutions; [Master Protect H 107. Breathable, water-based, silane/siloxane water-repellent sealer]: www.master-builder-solutions.com.

- 2) PROSOCO, Inc; Siloxane WB Concentrate or (Siloxane PD). Long Lasting, High performance water repellent.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

- A. Protection of Adjacent Work:
 1. Protect adjacent surfaces not intended to receive water repellent.
- B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.
- C. Do not start work until masonry mortar substrate is cured a minimum of 60 days.
- D. Remove loose particles and foreign matter.
- E. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.
- F. Scrub and rinse surfaces with water and let dry.
- G. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.
- H. Test for moisture content, according to water repellent manufacturers written instructions to ensure surface is dry enough.

3.03 APPLICATION

- A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.
- B. Apply two coats, minimum.
- C. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.
- D. Comply with manufacturer's written cleaning instructions.
- E. Test for PH Level, according to water repellent manufacturers written instructions to ensure chemical bond to silicate minerals.
- F. Provide manufacturer's field service representative to inspect preparation and application work continuously during entire application period to ensure that manufacturer's "best practices" for preparation and application are being followed.

END OF SECTION

SECTION 072100
THERMAL INSULATION**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Board insulation at cavity wall construction, over roof deck, and exterior wall behind EIFS wall finish.
- B. Batt insulation in exterior soffit, rake, and eave construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 REFERENCE STANDARDS

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- C. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2024.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.04 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store insulation indoors.
- B. Keep insulation clean and dry at all times. Do not allow insulation materials to become wet or soiled.
- C. Comply with Manufacturer's recommendations for handling, storage and protection.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Thermal Insulation Manufacturers:
 - 1. Dow Chemical Company; www.dow.com
 - 2. Owens Corning; www.owenscorning.com
 - 3. Johns Manville; www.jm.com
 - 4. Kingspan
 - 5. Atlas Roofing

2.02 APPLICATIONS

- A. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) board.
- B. Insulation for EIFS Assembly: Expanded Polystyrene EPS board.
- C. Miscellaneous Exterior Wall Insulation as called for in the drawings: Batt insulation with no vapor retarder.
- D. Insulation Over Roof Deck: Polyisocyanurate board.

2.03 FOAM BOARD INSULATION MATERIALS

- A. Expanded Polystyrene (EPS) Board Insulation: Comply with ASTM C578.
 - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 3. Board Size: 48 inch by 96 inch (1220 mm by 2440 mm).
 - 4. Board Thickness: 1-1/2 inch (38 mm).
 - 5. Board Edges: Square.

- B. Extruded Polystyrene Board (XPS) Insulation (Rigid Insulation): Extruded polystyrene board; ASTM C578; with Rigid Closed Cell surfaces, and the following characteristics:
1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 4. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
 5. R-value: Minimum R-13.
 6. Products:
 - a. Kingspan Insulation LLC; GreenGuard GG25-LG XPS Insulation Board: www.kingspan.com/#sle.
 - b. Owens Corning Corporation; FOAMULAR NGX Type ____ Next Generation Extruded: www.ocbuildingspec.com/#sle.
 - c. Or Equal.

2.04 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
 3. Formaldehyde Content: Zero.
 4. Thickness: 6 inch (___ mm) min or as indicated on drawings or width of framing minimum if not indicated.
 5. Products:
 - a. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
 - b. Or Equal.
 6. Substitutions: See Section 016000 - Product Requirements.

2.05 ACCESSORIES

- A. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.
- B. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.
- C. Insulation Retainage Mesh Netting:
1. Option 1:
 - a. Equal to J&R 1"x2" Mesh Insulation Netting
 - b. Width: 4 feet (NT-1250) or 8 feet (NT-1125)
 - c. Roll Product: Length 125 feet (NT-1125) or 250 feet (NT-1250)
 2. Option 2:
 - a. 20-Gauge Galvanized Steel Poultry Netting with 2 inch hexagonal mesh weave.
 3. Application: Must be used at all insulation installation locations where the batt insulation is not held in place on both sides by a rigid substrate or finish material.
- D. Mechanical Fasteners and Insulation clips: In accordance with insulation manufacturer's written recommendations.
- E. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT CAVITY WALLS

- A. Apply adhesive to back of boards:

1. Three continuous beads per board length.
- B. Install boards to fit snugly between wall ties.
- C. Install boards horizontally on walls.
 1. Place boards to maximize adhesive contact.
 2. Install in running bond pattern.
 3. Butt edges and ends tightly to adjacent boards and protrusions.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- E. Place 6 inches (152 mm) wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames, and tape seal in place to ensure continuity of vapor retarder and air seal.

3.03 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in wall spaces without gaps or voids. Do not compress insulation.
- C. Interior Ceilings: Lay on top of ceiling panel and suspension system. Fit tightly together. Do not install on top of or within 3 inches of recessed light fixtures unless fixture are approved for such use.
- D. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- E. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- F. Install Batts at all cracks around doors and openings.
- G. Retain insulation batts in place with wire mesh secured to framing members where applied in heights over 8 feet.
- H. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

3.04 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

SECTION 072400
EXTERIOR INSULATION AND FINISH SYSTEMS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Composite wall and soffit cladding of rigid insulation and reinforced finish coating, Class PB.
- B. Drainage and water-resistive barriers behind insulation board.

1.02 RELATED REQUIREMENTS

- A. 072100 - Thermal Insulation
- B. Section 079200 - Joint Sealants: Sealing joints between EIFS and adjacent construction and penetrations through EIFS.

1.03 REFERENCE STANDARDS

- A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.
- B. ASTM C297/C297M - Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions; 2016 (Reapproved 2024).
- C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- D. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2025.
- E. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2024.
- F. ASTM C1397 - Standard Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage; 2025.
- G. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive; 2025.
- H. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity; 2025.
- I. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
- K. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies; 2025.
- L. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013 (Reapproved 2021).
- M. ASTM G155 - Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials; 2025.
- N. ICC-ES AC219 - Acceptance Criteria for Exterior Insulation and Finish Systems; 2009, with Editorial Revision (2022).
- O. ICC-ES AC235 - Acceptance Criteria for EIFS Clad Drainage Wall Assemblies; 2015, with Editorial Revision (2022).
- P. NFPA 259 - Standard Test Method for Potential Heat of Building Materials; 2023, with Errata.
- Q. NFPA 268 - Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source; 2022.
- R. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

- B. Product Data: Provide data on system materials, product characteristics, performance criteria, and system limitations.
- C. Shop Drawings: Indicate wall and soffit joint patterns, joint details, and molding profiles.
- D. Selection Samples: Submit manufacturer's standard range of samples illustrating available coating colors and textures.
- E. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, and jointing requirements.
- F. Installer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Maintain copy of specified installation standard and manufacturer's installation instructions at project site during installation.
- B. EIFS Manufacturer Qualifications: Provide EIFS products other than insulation from the same manufacturer with qualifications as follows:
- C. Insulation Manufacturer Qualifications: Approved by manufacturer of EIFS and approved and labeled under third party quality program as required by applicable building code.
- D. Installer Qualifications: Company specializing in the type of work specified and with at least three years of documented experience.

1.06 MOCK-UPS

- A. Construct mock-up of typical EIFS application on specified substrate, size as indicated on drawings, and including flashings, joints, and edge conditions.
- B. Locate mock-up as indicated on drawings.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to project site in manufacturer's original, unopened containers with labels intact. Inspect materials and notify manufacturer of any discrepancies.
- B. Storage: Store materials as directed by manufacturer's written instructions.
 - 1. Protect adhesives and finish materials from freezing, temperatures below 40 degrees F (4 degrees C) and temperatures in excess of 90 degrees F (32 degrees C).
 - 2. Protect Portland cement based materials from moisture and humidity. Store under cover off the ground in a dry location.
 - 3. Protect insulation materials from exposure to sunlight.

1.08 FIELD CONDITIONS

- A. Do not prepare materials or apply EIFS under conditions other than those described in the manufacturer's written instructions.
- B. Do not prepare materials or apply EIFS during inclement weather unless areas of installation are protected. Protect installed EIFS areas from inclement weather until dry.
- C. Do not install coatings or sealants when ambient temperature is below 40 degrees F (5 degrees C).
- D. Do not leave installed insulation board exposed to sunlight for extended periods of time.

1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide manufacturer's standard material warranty, covering a period of not less than 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. Dryvit Systems, Inc; Dryvit Outsulation Plus MD EIFS, Class PB with Moisture Drainage: www.dryvit.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements

2.02 EXTERIOR INSULATION AND FINISH SYSTEM

- A. Exterior Insulation and Finish System: DRAINAGE type; reinforced finish coating on flat-backed insulation board adhesive-applied directly to water-resistive coating over substrate; provide a complete system that has been tested to show compliance with the following characteristics; include all components of specified system and substrate(s) in tested samples.
- B. Fire Characteristics:
 - 1. Flammability: Pass, when tested in accordance with NFPA 285.
 - 2. Ignitibility: No sustained flaming when tested in accordance with NFPA 268.
 - 3. Potential Heat of Foam Plastic Insulation Tested Independently of Assembly: No portion of the assembly having potential heat that exceeds that of the insulation sample tested for flammability (above), when tested in accordance with NFPA 259 with results expressed in Btu per square foot (mJ/sq m).
- C. Adhesion of Water-Resistive Coating to Substrate: For each combination of coating and substrate, minimum flatwise tensile bond strength of 15 psi (105 kPa), when tested in accordance with ASTM C297/C297M.
- D. Adhesion to Water-Resistive Coating: For each combination of insulation board and substrate, when tested in accordance with ASTM C297/C297M, maximum adhesive failure of 25 percent unless flatwise tensile bond strength exceeds 15 psi (105 kPa) in all samples.
- E. Water Penetration Resistance: No water penetration beyond the plane of the base coat/insulation board interface after 15 minutes, when tested in accordance with ASTM E331 at 6.24 psf (299 Pa) differential pressure with tracer dye in the water spray; include in tested sample at least two vertical joints and one horizontal joint of same type to be used in construction; disassemble sample if necessary to determine extent of water penetration.
- F. Drainage Efficiency: Average minimum efficiency of 90 percent, when tested in accordance with ASTM E2273 for 75 minutes.
- G. Salt Spray Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 300 hours exposure in accordance with ASTM B117, using at least three samples matching intended assembly, at least 4 by 6 inches (100 by 150 mm) in size.
- H. Freeze-Thaw Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 10 cycles, when tested in accordance with ICC-ES AC219 or ICC-ES AC235.
- I. Weathering Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 2000 hours of accelerated weathering conducted in accordance with ASTM G153 Cycle 1 or ASTM G155 Cycles 1, 5, or 9.
- J. Water Degradation Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 14 days exposure, when tested in accordance with ASTM D2247.
- K. Mildew Resistance: No growth supported on finish coating during 28 day exposure period, when tested in accordance with ASTM D3273.
- L. Abrasion Resistance Of Finish: No cracking, checking or loss of film integrity when tested in accordance with ASTM D968 with 113.5 gallons (500 liters) of sand.

2.03 MATERIALS

- A. Finish Coating Top Coat: Water-based, air curing, acrylic or polymer-based finish with integral color and texture.
 - 1. Texture: Dryvit Systems, Inc, Standard Textures, with Dirt Pickup Resistance; Sandblast DPR: www.dryvit.com/#sle.
 - 2. Texture: Dryvit Systems, Inc, Specialty Finish Options; Reflectit: www.dryvit.com/#sle.
- B. Base Coat: Fiber-reinforced, acrylic or polymer-based product compatible with insulation board and reinforcing mesh, Class PB.

- C. Reinforcing Mesh: Balanced, open weave glass fiber fabric, treated for compatibility and improved bond with coating, weight, strength, and number of layers as required to meet required system impact rating.
- D. Expanded Polystyrene (EPS) Board Insulation: Complies with ASTM C578.
 - 1. Board Thickness: As indicated on drawings.
- E. Water-Resistive Barrier Coating: Fluid-applied air and water barrier membrane; applied to sheathing; furnished or approved by EIFS manufacturer.

2.04 ACCESSORIES

- A. Insulation Adhesive: Type required by EIFS manufacturer for project substrate.
- B. Trim: EIFS manufacturer's standard PVC or galvanized steel trim accessories, as required for a complete project and including starter track and drainage accessories.
- C. Sealant Materials: Compatible with EIFS materials and as recommended by EIFS manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate is sound and free of oil, dirt, other surface contaminants, efflorescence, loose materials, or protrusions that could interfere with EIFS installation and is of a type and construction that is acceptable to EIFS manufacturer. Do not begin work until substrate and adjacent materials are complete and thoroughly dry.
- B. Verify that substrate surface is flat, with no deviation greater than 1/4 in (6 mm) when tested with a 10 ft (3 m) straightedge.

3.02 PREPARATION

3.03 INSTALLATION - GENERAL

- A. Install in accordance with EIFS manufacturer's instructions and ASTM C1397.
 - 1. Where different requirements appear in either document, comply with the most stringent.
 - 2. Neither of these documents supercedes provisions of Contract Documents that defines contractual relationships between parties or scope of this work.

3.04 INSTALLATION - WATER-RESISTIVE BARRIER

- A. Apply barrier coating as recommended by coating manufacturer; prime substrate as required before application.
- B. Seal substrate transitions and intersections with other materials to form continuous water-resistive barrier on exterior of sheathing, using method recommended by manufacturer.
- C. At door and window rough openings and other wall penetrations, seal water-resistive barrier and flexible flashings to rough opening before installation of metal flashings, sills, or frames, using method recommended by manufacturer.
- D. Lap flexible flashing or flashing tape at least 2 inches (50 mm) on each side of joint or transition.

3.05 INSTALLATION - INSULATION

- A. Install in accordance with manufacturer's instructions.
- B. Install back wrap reinforcing mesh at all openings and terminations that are not to be protected with trim.
- C. On wall surfaces, install boards horizontally. On horizontal surfaces, install boards _____.
- D. Place boards in a method to maximize tight joints. Stagger vertical joints and interlock at corners. Butt edges and ends tight to adjacent board and to protrusions. Achieve a continuous flush insulation surface, with no gaps in excess of 1/16 inch (1.6 mm).
- E. Fill gaps greater than 1/16 inch (1.6 mm) with strips or shims cut from the same insulation material.
- F. Rasp irregularities off surface of installed insulation board.

3.06 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Clean EIFS surfaces and work areas of foreign materials resulting from EIFS operations.

3.07 PROTECTION

- A. Protect completed work from damage and soiling by subsequent work.

END OF SECTION

SECTION 072500
WEATHER BARRIERS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Water-resistive barriers.
- B. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, joints around frames of openings in exterior walls, and any and all other openings and or penetrations through the wall..

1.02 DEFINITIONS

- A. Weather Barriers: Materials or assemblies forming water-resistive barriers, air barriers, vapor retarders, or combination of one or more assemblies.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- B. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- C. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

PART 2 PRODUCTS**2.01 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)**

- A. Air Barrier Sheet, Mechanically Fastened:
 - 1. Location: All Walls and soffits other than Pre-Engineered Metal Building walls that do not have stud/sheathing construction.
 - 2. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
 - 3. Water Vapor Permeance: 5 perms (286 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F (23 degrees C).
 - 4. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.
 - 5. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
 - 6. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches (50 mm) wide, compatible with sheet material; unless otherwise specified.
 - 7. Manufacturers:
 - a. DuPont Building Innovations; Tyvek Commercial Wrap with Tyvek Tape:
www.dupont.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.02 ACCESSORIES**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.

B. Mechanically Fastened Sheets:

1. Install sheets in shingle fashion to shed water; align horizontally.
2. Overlap seams as recommended by manufacturer, 6 inches (152 mm), minimum.
3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches (305 mm), minimum.
4. For applications indicated to be airtight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners as recommended by manufacturer.
5. Install water-resistive barrier over jamb flashings.
6. Install head flashings under water-resistive barrier.
7. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.

C. Openings and Penetrations in Exterior Water-Resistive Barriers:

1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches (127 mm) onto water-resistive barrier and at least 6 inches (152 mm) up jambs; mechanically fasten stretched edges.
2. At openings filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
3. At openings filled with nonflanged frames, seal water-resistive barrier to each side of framing at opening using flashing at least 9 inches (230 mm) wide, and covering entire depth of framing.
4. At head of openings, install flashing under water-resistive barrier extending at least 2 inches (50 mm) beyond face of jambs; seal water-resistive barrier to flashing.
5. At interior face of openings, seal gaps between window and door frames and rough framing using appropriate joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of water-resistive barrier.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Do not cover installed water-resistive barriers until required inspections have been completed.
- C. Take digital photographs of each portion of installation prior to covering up weather barriers.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 075235
SBS MODIFIED BITUMINOUS AND PVC HYBRID ROOFING

PART 1 GENERAL**1.01 SUMMARY**

- A. Work shall include, but is not limited to, the following: Tectum Deck Areas
 - 1. Remove existing roof system, including all flashings, down to tectum deck
 - 2. Preparation of existing tectum roof deck, and all flashing substrates.
 - 3. Rigid Insulation adhered.
 - 4. Cover Board adhered.
 - 5. SBS-modified bitumen base ply heat-welded.
 - 6. Min 60 mil PVC cap sheet adhered.
 - 7. Fully adhered PVC flashings.
 - 8. Liquid-applied, reinforced flashings.
 - 9. Edge Metals.
 - 10. All related materials and labor required to complete specified roofing necessary to receive specified manufacturer's warranty.
- B. Work shall include, but is not limited to, the following: Wood Deck Areas
 - 1. Remove existing roof system, including all flashings, down to wood deck
 - 2. Preparation of existing roof deck, and all flashing substrates.
 - 3. Rigid Insulation adhered.
 - 4. Cover Board adhered.
 - 5. SBS-modified bitumen base ply heat-welded.
 - 6. Min 60 mil PVC cap sheet adhered.
 - 7. Fully adhered PVC flashings.
 - 8. Liquid-applied, reinforced flashings.
 - 9. Edge Metals.
 - 10. All related materials and labor required to complete specified roofing necessary to receive specified manufacturer's warranty.
- C. Work shall include, but is not limited to, the following: Steel Deck Areas
 - 1. Remove existing roof system, including all flashings, down to steel deck
 - 2. Preparation of existing steel roof deck, and all flashing substrates.
 - 3. Rigid Insulation and Cover Board mechanically fastened
 - 4. SBS-modified bitumen base ply heat-welded.
 - 5. Min 60 mil PVC cap sheet adhered
 - 6. Fully adhered PVC flashings.
 - 7. Liquid-applied, reinforced flashings.
 - 8. Edge Metals.
 - 9. All related materials and labor required to complete specified roofing necessary to receive specified manufacturer's warranty.

1.02 DEFINITIONS

- A. ASTM D 1079-Definitions of Term Relating to Roofing and Waterproofing.
- B. The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual, Fifth Edition Glossary.

1.03 REFERENCES

- A. AMERICAN SOCIETY OF CIVIL ENGINEERS - Reference Document ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- B. AMERICAN STANDARD OF TESTING METHODS (ASTM):
 - 1. ASTM C 836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
 - 2. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants

3. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Damp proofing, and Waterproofing.
 4. ASTM D 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 5. ASTM D 3019 - Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibred, Asbestos-Fibred, and Non-Asbestos-Fibred.
 6. ASTM D 3746 - Standard Test Method for Impact Resistance of Bituminous Roofing System.
 7. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
 8. ASTM D 5147 - Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material.
 9. ASTM D 5849 - Standard Test Method for Evaluating Resistance of Modified Bituminous Roofing Membrane to Cyclic Fatigue (Joint Displacement)
 10. ASTM D 6163 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
 11. ASTM D 6163 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
 12. ASTM D 6164 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
 13. ASTM D 7379 - Standard Test Methods for Strength of Modified Bitumen Sheet Material Laps Using Cold Process Adhesive.
 14. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.
 15. ASTM E 1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
- C. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)::
1. ANSI/SPRI/FM 4435/ES-1 Wind Design Standard for Edge System Used with Low Slope Roofing System.
 2. ANSI/FM 4474- American National Standard for Evaluating the Simulated Wind Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures.
- D. COOL ROOF RATING COUNCIL (CRRC)
- E. FACTORY MUTUAL (FM):
1. FM 4450 - Approval Standard - Class I Insulated Steel Roof Decks.
 2. FM 4470 - Approval Standard - Class I Roof Covers.
- F. INTERNATIONAL CODES COUNCIL (ICC):
1. 2018 International Building Code (IBC).
- G. NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA).
1. UL 790 Standard Test Methods for Fire Tests of Roof Coverings.
 2. UL 1256 – Fire Test of Roof Deck Constructions.

1.04 ACTION SUBMITTALS

- A. Contractor must submit Project Registration Form (PRF) indicating project has been registered with the manufacturer and approved for warranty.
- B. Training Cards/Documentation: 50% of the contractor's crew actively working on this project site shall hold a certification card from the manufacturer indicating they have been trained on the specific application specified herein. **NO EXCEPTIONS.**
- C. Product Data Sheets: Submit manufacturer's product data sheets, installation instructions and/or general requirements for each component.
- D. Safety Data Sheets: Submit manufacturer's Safety Data Sheets (SDS) for each component.
- E. Sample warranty from the manufacturer and contractor.
- F. Provide roof plan and representative detail drawings.

1.05 INFORMATIONAL SUBMITTALS

- A. Submit a letter from the roofing manufacturer indicating the contractor is an authorized applicator.

1.06 CLOSEOUT SUBMITTALS

- A. Warranty: Provide manufacturer's and contractor's warranties upon project completion.

1.07 QUALITY ASSURANCE**A. PRE-CONSTRUCTION MEETING**

1. Manufacturer representative, contractors superintendent/project manager, designer of record and building owner representative must be in attendance
2. Contractor must present approved submittals.
3. Contractor shall provide warranty registration form approved by the manufacturer.

B. MANUFACTURER QUALIFICATIONS:

1. Manufacturer shall have 20 years of manufacturing experience.
2. Manufacturer shall have trained technical service representatives employed by the manufacturer, independent of sales.
3. Manufacturer shall provide site visit reports in a timely manner.

C. CONTRACTOR QUALIFICATIONS:

1. Training Cards/Documentation: 50% of the contractor's crew actively working on this project site shall hold a certification card from the manufacturer indicating they have been trained on the specific application specified herein. **NO EXCEPTIONS**
2. Contractor must have 5 years documented commercial experience of similar scope and size. References for building owner and designer must be provided.
3. Contractor shall be authorized by the manufacturer to install specified materials prior to the bidding period through satisfactory project completion.
4. Applicators shall have completed projects of similar scope using same or similar materials specified.
5. Contractor shall provide full time, on-site superintendent or foreman experienced with the specified roofing from beginning through satisfactory project completion.
6. Applicators shall be skilled in the application methods for all materials.
7. Contractor shall maintain a daily record, on-site, documenting material installation and related project conditions.
8. Contractor shall maintain a copy of all submittal documents, on-site, available at all times for reference.

D. ROOFING MANUFACTURER FIELD REPORTS

1. The General Contractor will be required to transmit all roofing manufacturer's field reports directly to the Architect as required by the "Contractor's Authorization for Site Visit Report Distribution" form found attached to the end of this section.
2. Installation cannot begin until the Architect receives this executed form.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Refer to each product data sheet or other published literature for specific requirements.
- B. Deliver materials and store them in their unopened, original packaging, bearing the manufacturer's name, related standards, and any other specification or reference accepted as standard.
- C. Protect and store materials in a dry, well-vented, and weatherproof location. Only materials to be used the same day shall be removed from this location. During cold weather, store materials in a heated location, removed only as needed for immediate use.
- D. When materials are to be stored outdoors, store away from standing water, stacked on raised pallets or dunnage, at least 4 in or more above ground level. Carefully cover storage with "breathable" tarpaulins to protect materials from precipitation and to prevent exposure to condensation.
- E. Carefully store roof membrane materials delivered in rolls on-end with selvage edges up. Store and protect roll storage to prevent damage.
- F. Properly dispose of all product wrappers, pallets, cardboard tubes, scrap, waste, and debris. All damaged materials shall be removed from job site and replaced with new, suitable materials.

1.09 SITE CONDITIONS

- A. SAFETY:

1. The contractor shall be responsible for complying with all project-related safety and environmental requirements.
2. Heat-welding shall include heating the specified membrane ply using propane roof torches or electric hot-air welding equipment. The contractor shall determine when and where conditions are appropriate to utilize heat-welding equipment. When conditions are determined by the contractor to be unsafe to proceed, equivalent SBS-modified bitumen materials and methods shall be utilized to accommodate requirements and conditions.
3. Refer to NRCA CERTA recommendations, local codes and building owner's requirements for hot work operations.
4. The contractor shall review project conditions and determine when and where conditions are appropriate to utilize the specified liquid-applied, or semi-solid roofing materials. When conditions are determined by the contractor to be unsafe or undesirable to proceed, measures shall be taken to prevent or eliminate the unsafe or undesirable exposures and conditions, or equivalent approved materials and methods shall be utilized to accommodate requirements and conditions.
5. The contractor shall refer to product Safety Data Sheets (SDS) for health, safety, and environment related hazards, and take all necessary measures and precautions to comply with exposure requirements.

B. ENVIRONMENTAL CONDITIONS:

1. Monitor substrate temperature and material temperature, as well as all environmental conditions such as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade. Ensure conditions are satisfactory to begin work and ensure conditions remain satisfactory during the installation of specified materials. Materials and methods shall be adjusted as necessary to accommodate varying project conditions. Materials shall not be installed when conditions are unacceptable to achieve the specified results.
2. Precipitation and dew point: Monitor weather to ensure the project environment is dry before, and will remain dry, during the application of roofing materials. Ensure all roofing materials and substrates remain above the dew point temperature as required to prevent condensation and maintain dry conditions.
3. Self-adhesive membrane application: During cold weather, store the specified self-adhesive membrane and primer materials in heated storage areas to ensure materials remain no less than 70°F (21°C) during application. Ensure conditions allow primer to remain tacky, but not wet so that primer will not transfer to finger when touched. Self-adhesive primer shall not fully dry and lose tack before applying the self-adhesive membrane. Ensure conditions remain satisfactory to achieve membrane adhesion as specified.
4. Heat-Welding Application: Take all necessary precautions and measures to monitor conditions to ensure all environmental conditions are safe to use roof torches and hot-air welding equipment. Combustibles, flammable liquids and solvent vapors that represent a hazard shall be eliminated. Flammable primers and cleaners shall be fully dry before proceeding with heat-welding operations. Prevent or protect wood, paper, plastics and other such combustible materials from direct exposure to open flames from roof torches. Refer to NRCA CERTA recommendations.

1.10 PERFORMANCE REQUIREMENTS

A. WIND UPLIFT RESISTANCE:

1. Per the requirements of the International Building Code, Section 1504.3.1, the acceptable manufacturer's listed herein MUST provide performance testing for each system type and those test results must be in accordance with FM 4474, UL 580 or UL 1897 and shall be provided for each job specific roof system and zone location as described under Section 1.01 herein. Prescriptive enhancements for different zones will not be allowed.
 - a. Roof System Design Pressures: Calculated in accordance with latest adopted ASCE 7, or applicable standard, for the specified roof system attachment requirements.
 - b. Roof System must meet or exceed those shown on the drawings. Written documentation and or proof of testing from the manufacturer is required stating compliance. *** **NO EXCEPTIONS** ***
2. Written documentation and or proof of testing by a Third Party Testing Agency from the roofing manufacturer is required stating compliance. *** **NO EXCEPTIONS** ***

B. FIRE CLASSIFICATION:

1. Performance testing shall be in accordance with UL 790, ASTM E108, FM 4450 or FM 4470 to meet the 1/2:12 roof slope requirement.
 - a. Meets requirements of UL Class A or FM Class A.
2. Performance testing shall be in accordance with UL 1256, FM 4450 or FM 4470 to meet the specified requirements for interior flame spread and fuel contribution.
 - a. Meets requirements of UL 1256, or FM Class 1.

C. ROOF SLOPE:

1. Finished roof slope for SBS modified bitumen surfaces shall be 1/8 inch per foot minimum for roof drainage.

D. IMPACT RESISTANCE:

1. Performance testing for impact resistance shall be in accordance with FM 4450, FM 4470, ASTM D3746 or CGSB 37-GP 56M to meet the specified impact resistance requirements.
 - a. Meets requirements for FM-SH (Severe Hail), ASTM D3746, or CGSB 37-GP 56M.

1.11 WARRANTY

- A. Manufacturers warranty must include all components of the roof system including PVC membranes and liquid applied flashings.
- B. Manufacturer's No Dollar Limit (NDL) Warranty. The manufacturer shall provide the owner with the manufacturer's warranty providing labor and materials for 20 years from the date the warranty is issued. Warranty shall include wind speeds up to 74 mph.
- C. The contractor shall guarantee the workmanship and shall provide the owner with the contractor's warranty covering workmanship for a period of 2 years from completion date.

PART 2 PRODUCTS**2.01 MANUFACTURER**

- A. SINGLE SOURCE MANUFACTURER: All SBS modified bitumen membrane and flashing sheets shall be manufactured by a single supplier with 20 years or more manufacturing history in the US.
 1. Comply with the Manufacturer's requirements as necessary to provide the specified warranty.
- B. PRODUCT QUALITY ASSURANCE PROGRAM: Manufacturer shall be an ISO 9001 registered company. A 'Quality Compliance Certificate (QCC) for reporting/confirming the tested values of the SBS-Modified Bitumen Membrane Materials will be supplied upon request.
- C. ACCEPTABLE MANUFACTURERS: All manufacturers shall provide products that meet or exceed the product performance and system testing specified herein.
 1. Soprema, located at: 310 Quadral Dr., Wadsworth, OH 44281; Tel: 800-356-3521; Tel: 330-334-0066; Website: www.soprema.us.
 2. Verisco Roofing Systems: P.O. Box 1289, Carlisle, PA 17013; Tel: 1.800.992.7663; Website: www.versico.com/
 3. Carlisle SynTec Systems, located at 1285 Ritner Hwy, Carlisle, PA 17013; Tel: 800-479-6832; Website: <https://www.carlisesyntec.com>.
 4. Seaman Corporation, located at 1000 Venture Blvd, Wooster, OH 44691; Tel 800-927-8578; Website: www.seamancorp.com
 5. Sika Corporation, located at 201 Polito Avenue Lyndhurst New Jersey 07071; Tel: 201-933-8800; Fax: 201-804-1076; Website: www.sika.com.
 6. Or Approved Equals:
 - a. Acceptable Alternate Manufacturers: Either the General Contractor, Sub-Contractor, Roof Manufacturer, or Roof Manufacturer's Representative must submit **PRIOR TO BID** proof of Third Party Testing indicating that the JOB SPECIFIC ROOF SYSTEMS have been tested and passed the physical performance and physical characteristic requirements of FM 4474, UL 580 or UL 1897. ***** NO EXCEPTIONS *****
 - b. Per the requirements of Specification Section 000102 Project Information, this substitution request along with the proof of testing compliance must be received at least 7 days prior to bid opening. If not, then no consideration or review will be granted.

- D. ALL manufacturers must provide a 60 mil min PVC waterproofing layer. 60 mil nominal products will not be accepted

2.02 ROOFING SYSTEM

- A. Roofing System Basis of Design: Soprema

2.03 SBS-MODIFIED BITUMEN MEMBRANES

1. BASE PLY, HEAT_WELDED

- a. SOPREMA SOPRALENE 180 SP 3.0: SBS-modified bitumen membrane with plastic burn-off film on the bottom surface and a sanded top surface. Glass fiber reinforcement. Meets or exceeds ASTM D6164, Type I, Grade S, per ASTM D5147 test methods:
- 1) Thickness: 118 mils
 - 2) Width: 39.4 in (1 m)
 - 3) Length: 32.8 ft (10 m)
 - 4) Roll weight: 81 lb (36.7 kg)
 - 5) Net mass per unit area, lb/100 sq ft (g/sq m):
 - (a) 75 lb (3662 g)
 - 6) Peak load @ 0°F (-18°C), lbf/in (kN/m):
 - (a) MD 115 lbf/in (20.1 kN/m), XMD 90 lbf/in (15.8 kN/m)
 - 7) Elongation at peak load @ 0°F (-18°C), lbf/in (kN/m):
 - (a) MD 35%, XMD 40%
 - 8) Peak load @ 73.4°F (23°C), lbf/in (kN/m):
 - (a) MD 85 lbf/in (14.9 kN/m), XMD 65 lbf/in (11.4 kN/m)
 - 9) Elongation at peak load @ 73.4°F (23°C), lbf/in (kN/m):
 - (a) MD 55%, XMD 60%
 - 10) Ultimate Elongation @ 73.4°F (23°C), lbf/in (kN/m):
 - (a) MD 65%, XMD 80%
 - 11) Tear Strength @ 73.4°F (23°C), lbf (N):
 - (a) MD 125 lbf (556 N), XMD 85 lbf (378 N)
 - 12) Low temperature flexibility, °F (°C):
 - (a) MD/XMD: -15°F (-26°C)
 - 13) Dimensional stability, %:
 - (a) MD/XMD: Less than 0.5%
 - 14) Compound stability, °F (°C):
 - (a) MD/XMD: 240°F (116°C)

B. CAP SHEET:

1. PVC CAP SHEET, FULLY ADHERED:

- a. SOPREMA SENTINEL PVC P150 HFB: Polyester reinforced, thermoplastic polyvinyl chloride membrane with a heavy fleece back underside.
- 1) Overall Thickness ASTM D4434 (ASTM D638):
 - (a) Manufacturer shall provide membrane at specified minimum 60 mils
 - 2) Thickness over Scrim (ASTM D7635):
 - (a) Manufacturer shall provide membrane with minimum 30 mils compound thickness above reinforcement / scrim.
 - 3) Width: 10 ft (3.0 m)
 - 4) Length: 80 ft (24.4 m)
 - 5) Physical Properties ASTM D4434.
 - (a) Breaking Strength, lbf/in
 - (1) 400 (XMD)
 - (b) Elongation at Break %
 - (1) 30 (XMD)
 - 6) Color: White

2. PVC FLASHING, FULLY ADHERED:

- a. SOPREMA® SENTINEL® PVC P150: Polyester reinforced, thermoplastic polyvinyl chloride membrane with a smooth back underside. Mechanically fastened in 6 in (minimum) side-laps.

- 1) Overall Thickness (ASTM D4434 and ASTM D638):
 - (a) Manufacturer shall provide membrane at specified minimum 60 mils
- 2) Thickness over Scrim (ASTM D7635):
 - (a) Manufacturer shall provide membrane with minimum 30 mils compound thickness above reinforcement / scrim.
- 3) Width: 10 ft (3.0 m)
- 4) Length: 100 ft (30.5 m)
- 5) Physical Properties ASTM D4434.
 - (a) Breaking Strength, lbf/in
 - (1) 300 (XMD)
 - (b) Elongation at Break - %
 - (1) 25 (XMD)
 - (c) Tear Strength, lbf
 - (1) 80 (XMD)
- 6) Color: white
3. FLASHING SYSTEM, LIQUID-APPLIED:
 - a. ALSAN RS 230 FLASH: Polymethacrylate (PMMA) liquid resin with polyester reinforcing fleece fabric fully embedded into the resin to form fully-reinforced waterproofing membrane flashings. All LIQUID-APPLIED flashing shall be manufactured by the single-sourced membrane supplier.
 - 1) VOC Content: No VOC Content.
 - 2) SOPREMA ALSAN RS CATALYST POWDER: Reactive agent added to the liquid resin to induce polymerization.
 - 3) SOPREMA ALSAN RS FLEECE: Polyester reinforcement fabric.
 - 4) Color: White.

2.04 ACCESSORIES

A. RIGID INSULATION

1. SOPREMA SOPRA-ISO: Closed cell polyisocyanurate foam core bonded on each side to a glass fiber-reinforced felt facer.
 - 1) Thickness: 1.5 in minimum board thickness. Total thickness to meet specified insulation system thermal resistance 'R' value or as called for on the drawings, whichever is greater.
 - 2) Meets or exceeds ASTM C1289, Type II, Class 1, Grade 2 (20 psi).

B. COVER-BOARD

- a. SOPREMA SOPRABOARD: Mineral fortified, asphaltic roof substrate board with glass fiber facers. For use as roof cover-board and for vertical flashing substrate. ASPHALTIC ROOF BOARD shall be manufactured by the membrane supplier.
 - 1) Thickness: 1/4 in
 - 2) Dimensions: 4 x 8 ft acceptable for mechanical attachment, insulation adhesive or asphalt application.
 - 3) Water absorption: Less than 1 percent per ASTM D994.
 - 4) Impact resistance: Included in FM Approvals per 4450/4470 for FM Severe Hail (SH) rating.
 - 5) Compressive strength, psi (kPa) measured at 50 percent compression, per ASTM C472:
 - (a) 1/4 in board: 900lbs
 - 6) Puncture resistance, lbf (N) per ASTM E154:
- b. Georgia Pacific DensDeck Prime: 1/2"
- c. National Gypsum Dexcel FA: 1/2"
- d. SOPRASMART BOARD 180 (may be used in lieu of Sopraboard and base ply)
 - 1) Non-woven polyester reinforced SBS modified bitumen membrane base ply factory laminated to 1/8 in thick SOPRABOARD.
 - 2) Dimensions: 3 x 8 ft board dimension.
 - 3) Top Surfacing: SBS-modified bitumen membrane ply with sanded top surface.
 - 4) Side-laps: 3 in DUO-Selva side-lap consisting of 2 in self-adhesive, and 1 in SBS-modified bitumen for heat welding.

- 5) End-laps: Butted end-laps, with 1 in membrane overlap. Sealed watertight using SOPRALAP STICK or SOPRALAP SP.
 - (1) a) 1/8 in board: 90 (400)
- C. INSULATION ADHESIVE
 - (a) POLYURETHANE FOAM INSULATION ADHESIVE
 - b. SOPREMA DUOTACK 365 or DUOTACK SPF: Two-component, polyurethane foam insulation adhesive, applied in ribbons from cannisters, cartridges or two-component bulk packaging with pump-driven delivery system.
 - 1) Ribbon size: As required by manufacturer
 - 2) Ribbon spacing: As required to meet specified wind uplift resistance performance.
 - (a) 12 in on-centers
 - (b) 6 in on-centers
 - (c) 4 in on-centers
- D. PVC MEMBRANE ADHESIVE:
 - 1. SOPREMA® DUOTACK® SPF: Two-component elastomeric polyurethane adhesive. Formulated to adhere fleece back PVC membranes.
 - a. VOC Content: 250 g/L or less.
- E. PRE-MANUFACTURED ROOF CURBS:
 - 1. Ensure all curbs are included and compatible with roofing system as specified.
 - 2. Contractor's option to site build roof curbs, providee they match the performance and construction of the pre-manufactured products listed herein at a minimum.
 - 3. Pre-manufactured, engineered, single piece welded aluminum roof curbs as manufactured by one of the following:
 - a. Curb Technologies, LLC
 - b. KCC International, Inc.
 - c. Or Approved Equal
- F. ROOF DRAINS (FOR RE-ROOF PROJECTS ONLY)
 - 1. OMG Hercules Plus RetroDrain with Vortex BreakerStrainer or approved equal
 - 2. Strainer Dome: Yellow Vortex Breaker made of cast aluminum
 - 3. Clamp ring: Cast aluminum
 - 4. Drain Body: 11 Ga. (.125") spun aluminum
 - 5. Drain Flange: 17 1/2" diameter with sump area
 - 6. Drain Seal: Watertight U-Flow mechanical seal requires U-Flow screwdriver
 - 7. Drain Stem: 12" length minimum. Provide custom legth if necessary to clear
 - 8. Drain Diameter: Match existing drain diameter.
 - 9. Clamp Ring: Cast aluminum
 - 10. Conforms to ASME 112.6.4 and CAS-B79-08 standards.
- G. PVC FLASHING ADHESIVE:
 - 1. SOPREMA SENTINEL S BONDING ADHESIVE: Solvent-based adhesive. Formulated to adhere smooth back PVC flashings.
 - a. VOC Content: 199.5 g/L or less.
- H. EDGE METALS:
 - 1. SOPRAMETAL: Fascia, Copings and Expansion Joints pre fabricated and provided by the roof membrane manufacturer. Shop broke or contractor provided edge metals will not be accepted.
- I. EDGE METAL COLORED COVER:
 - 1. SOPRA-TITE SENTINEL DRIP EDGE
 - 2. Size: As called for on the drawings.
 - 3. Color: As chosen by the Architect from the manufacturers full range.
- J. HIGH TEMPERATURE UNDERLAYMENT
 - 1. LASTOBOND SHIELD HT: Self Adhered membrane to be applied under all edge metals and expansion joints.
 - a. High Temperature Resistance of 240 deg F

- b. Trilaminate facer
- K. PRIMERS:
 - 1. SOPREMA ELASTOCOL 500 Primer: Asphalt cut-back primer. Primer for the preparation of membrane substrates for asphalt, heat-welded, hot asphalt and COLPLY and COLPLY MODIFIED ADHESIVE, solvent-based, cold adhesive-applied and cement applications.
 - a. Meets or exceeds ASTM D41
 - b. VOC content: 350 g/L or less.
 - 2. SOPREMA ELASTOCOL STICK Primer: Self-adhesive membrane primer. SBS polymer, resin and, solvent-based primer for the preparation of membrane substrates for self-adhesive SBS membrane and self-adhered SBS flashing applications.
- L. GENERAL PURPOSE ROOFING CEMENT AND MASTIC
 - 1. SOPREMA SOPRAMASTIC: SBS Mastic. Fiber-reinforced, roofing cement, packaged in 5 gallon pails. General purpose roofing cement for low-slope roofing used for sealing membrane T-joints and membrane edges along terminations, transitions and at roof penetrations.
 - a. VOC Content: 190 g/L or less.
 - b. Meets or exceeds ASTM D4586, Type I, Class II.
 - 2. SOPREMA SOPRAMASTIC: SBS Mastic. Fiber-reinforced, roofing cement, packaged in 10.4 oz caulk tubes. General purpose roofing cement for low-slope roofing used for sealing membrane T-joints and membrane edges along terminations, transitions and at roof penetrations.
 - a. VOC Content: 190 g/L or less.
 - b. Meets or exceeds ASTM D4586, Type I, Class II.
- M. GENERAL PURPOSE SEALANT
 - 1. SOPREMA SOPRAMASTIC SP1: General purpose, paintable, gun-grade, elastomeric, polyether moisture curing sealant for sealing SBS membrane terminations, Kynar 500 PVDF, horizontal and vertical construction joints.
 - a. VOC Content: 20 g/L or less.
 - b. Meets or exceeds ASTM C920, Type S, Grade NS, Class 50.
 - c. Standard color, custom color.
 - 2. SOPREMA SOPRAMASTIC ALU: Modified bitumen mastic, aluminum hued for application to membrane edge and perimeter metal.
 - a. VOC Content: 270 g/L or less.
 - b. Standard color.
- N. LIQUID-APPLIED REINFORCED FLASHING SYSTEM: (used at penetrations and low flashing heights)
 - 1. ALSAN RS 230 FLASH, Catalyzed polymethacrylate (PMMA) resin with polyester reinforcing fleece fabric fully embedded into the resin to form fully-reinforced waterproofing membrane flashings.
 - a. VOC Content: No VOC content.
 - b. SOPREMA ALSAN RS CATALYST POWDER: Reactive agent added to the PMMA liquid resin to induce curing.
 - c. SOPREMA ALSAN RS FLEECE: Polyester reinforcement fabric.
 - d. Color: Flash color and finish to match Field.
- O. WALKWAY PROTECTION:
 - 1. SOPREMA SENTINEL WALK-WAY PAD: PVC walkway protection mat.
 - a. Width: 30 in (0.762 m)
 - b. Length: 50 ft (15.24 m)
 - c. Color: grey

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination includes visual observations, qualitative analysis, and quantitative testing measures as necessary to ensure conditions remain satisfactory throughout the project.
- B. The contractor shall examine all roofing substrates including, but not limited to: insulation materials, roof decks, walls, curbs, rooftop equipment, fixtures, and wood blocking.

- C. The applicator shall not begin installation until conditions have been properly examined and determined to be clean, dry and, otherwise satisfactory to receive specified roofing materials.
- D. During the application of specified materials, the applicator shall continue to examine all project conditions to ensure conditions remain satisfactory to complete the specified roofing system.

3.02 PREPARATION

- A. Before commencing work each day, the contractor shall prepare all roofing substrates to ensure conditions are satisfactory to proceed with the installation of specified roofing materials. Preparation of substrates includes, but is not limited to, substrate repairs, securement of substrates, eliminating all incompatible materials, and cleaning.
- B. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory to begin work. Commencing of work shall indicate contractor's acceptance of conditions.

3.03 PRIMER APPLICATION

- A. Examine all substrates, and conduct adhesion peel tests as necessary, to ensure satisfactory adhesion is achieved.
- B. Apply the appropriate specified primer to dry, compatible substrates as required to enhance adhesion of new specified roofing materials.
- C. Apply primer using brush, roller, or sprayer at the rate published on the product data sheet. Lightly prime for uniform coverage, do not apply heavy or thick coats of primer.
- D. Asphalt Primer: Apply primer to dry compatible masonry, metal, wood and other required substrates before applying asphalt and heat-welded membrane plies. Primer is optional for solvent based solvent-based SBS adhesives and cements. Refer to product data sheets.
- E. Self-Adhesive Membrane Primer: Apply to dry, compatible substrates as required to enhance adhesion of self-adhesive membrane plies. Ensure self-adhered membrane primer is tacky to-the-touch, but not wet. Primer should not transfer to the finger tips when touched.
- F. Project conditions vary throughout the day. Monitor changing conditions, monitor the drying time of primers, and monitor the adhesion of the membrane plies. Adjust primer and membrane application methods as necessary to achieve the desired results.

3.04 INSULATION SYSTEM APPLICATION

- A. Follow insulation system component product data sheets, published general requirements and, approvals.
- B. Install all insulation system components on clean, dry, uniform and, properly prepared substrates.
- C. All insulation system boards shall be carefully installed and fitted against adjoining sheets to form tight joints.
- D. Insulation system boards that must be cut to fit shall be saw-cut or knife-cut in a straight line, not broken. Chalk lines shall be used to cut insulation components. Uneven or broken edges shall not be accepted. Remove dust and debris that develops during cutting operations
- E. Stagger successive layers of insulation 12 in vertically and laterally to ensure board joints do not coincide with joints from the layers above and below.
- F. Crickets, saddles, and tapered edge strips shall be installed before installing Cover-boards.
- G. Install tapered insulation, saddles and crickets as required to ensure positive slope for complete roof drainage.
- H. Cover-boards shall be installed to fit tight against adjacent boards. When required by the Cover-board manufacturer, a uniform gap shall be provided between Cover-boards using a uniform guide placed between board joints to form a gap between all boards during installation.
- I. The finished insulation system surface shall be tight to, and flush with, adjacent substrates to form a satisfactory substrate to install specified roof membrane and flashings.
- J. Install specified cants where required for membrane flashing transitions

3.05 HEAT WELDING

- A. The Contractor is responsible for project safety. Where conditions are deemed unsafe to use open flames, manufacturer's alternate membrane application methods shall be used to install SBS modified bitumen membrane and flashings. Acceptable alternate installation methods include hot asphalt, cold adhesive-applied, self-adhered membranes and mechanically fastened plies. Hot-air welding equipment may be used in lieu of roof torches to seal membrane side and end laps where heat welding the laps is necessary. Refer to NRCA CERTA, local codes and building owner's requirements for hot work operations.
- B. Single or multi-nozzle, hand-held propane roof torches shall be used to install heat-welded membrane and flashing plies. Multi-nozzle carts (dragon wagons) may also be utilized to install membrane plies. Seven (7) nozzle carts are recommended for more uniform heat application in lieu of five (5) nozzle carts.

3.06 SBS MASTIC AND GENERAL PURPOSE ROOFING CEMENT APPLICATION

- A. Apply SOPREMA SOPRAMASTIC general purpose SBS mastic and roofing cement to seal drain leads, metal flanges, seal along membrane edge at terminations, and where specified and required in detail drawings.
- B. Do not use general purpose SBS mastics and roofing cement where flashing cement applications are required. Do not use SBS mastics and roofing cement beneath SBS-modified bitumen membrane and flashing plies.
- C. Apply general purpose SBS mastic and elastic roofing cement using caulk gun, or notched trowel at 2.0 – 2.5 gallons per square on each surface. Application rates vary based on substrate porosity and roughness. Tool-in as necessary to seal laps
- D. Embed matching granules into wet cement where exposed.

3.07 HEAT-WELDED, FULLY ADHERED MEMBRANE APPLICATION

- A. Follow material product data sheets and published general requirements for installation instructions.
- B. Ensure environmental conditions are safe and satisfactory, and will remain safe and satisfactory, during the application of the heat-welded membrane and flashings.
- C. Ensure all primers are fully dry before beginning heat-welding operations.
- D. Unroll membrane onto the roof surface and allow time to relax prior to heat welding.
- E. Starting at the low point of the roof, lay out the membrane to ensure the plies are installed perpendicular to the roof slope, shingled to prevent back-water laps.
- F. Ensure all roofing and flashing substrates are prepared and acceptable to receive the heat-welded membrane.
- G. Cut membrane to working lengths and widths to conform to rooftop conditions, and lay out to always work to a selvage edge.
- H. Ensure specified side-laps and end-laps are maintained. End-laps should be staggered 3 ft apart.
- I. Direct roof torch on the roll as necessary to prevent overheating and damaging the membrane and substrates.
- J. As the membrane is unrolled, apply heat to the underside of the membrane until the plastic burn-off film melts away. Continuously move the torch side-to-side across the underside of the roll to melt the bitumen on the underside of the sheet, while continuously unrolling membrane.
- K. While unrolling and heating the sheet, ensure approximately 1/4 to 1/2 in of hot bitumen flows ahead of the roll as it is unrolled, and there is 1/8 to 1/4 in bleed out at all laps.
- L. Adjust the application of heat to the underside of the membrane and to substrate as required for varying substrates and environmental conditions.
- M. At the 6 in end-laps, melt the plastic burn-off film from the top surface or embed granules and remove surfacing, where present, using a torch or hot-air welder.

- N. At end-laps where T-Joints exist, cut a 45 degree dog-ear away from the selvage edge, or otherwise ensure the membrane is fully heat-welded watertight at all T-joints.
- O. Each day, physically inspect all side and end-laps, and ensure the membrane is sealed watertight. Where necessary, use a torch or hot-air welder and a clean trowel to ensure all laps are fully sealed.
- P. Inspect the installation each day to ensure the plies are fully adhered. Repair all voids, wrinkles, open laps and all other deficiencies.
- Q. Offset cap sheet side and end-laps away from the base ply laps so that cap sheet laps are not located within 18 in of base ply laps.

3.08 PVC MEMBRANE APPLICATION (DUOTACK SPF)

- A. Follow material product data sheets and published general requirements for installation instructions.
- B. Refer to DUOTACK SPF published product data sheets. The ambient and surface temperature shall be between 50°F (-1°C) and 100°F (38°C) during installation.
- C. DUOTACK SPF shall be applied to the SBS modified bitumen base ply or cap sheet in the suggested "Spatter Pattern" indicated in manufacturer's published product data sheets.
- D. Apply adhesive from spray nozzle located 2 to 3 feet above the roof surface using a sweeping motion from side to side to evenly distribute the adhesive at approximately 3,000 square feet (30 squares) per adhesive kit.
- E. Apply adhesive to prevent contact between bare PVC side-laps and the adhesive.
- F. Refer to published literature for recommended adhesive "set" time before applying membrane. Monitor changing environmental conditions to ensure satisfactory results as adhesive set time varies with environmental conditions.
- G. Unroll the PVC membrane into the adhesive so only the fleece makes contact with adhesive. Prevent contact between bare side laps and adhesive.
- H. Unroll the PVC to prevent wrinkles, and apply pressure using a roller or push broom to ensure complete adhesion between the fleece underside and the adhesive.
- I. End-laps shall be butted, and a 6 in wide PVC membrane cover-strip shall be welded over the butted end joint.
- J. SOPREMA T-JOINT PATCHES shall be hot-air welded to the membrane at all T-joint intersections. Chamfer the welding seam prior to installing T-JOINT PATCHES using an edging tool or by heating the edge and rolling.
- K. Hot-air weld all side and end-laps with minimum 1-1/2 in welds.
- L. At PVC terminations at roof edges, walls and curbs, fasten the perimeter edge of the membrane with appropriate fasteners, seam plates or flat termination bars to the horizontal deck or vertical substrate along the termination.
- M. Fasten membrane termination 12 in on-centers maximum along membrane terminations. Locate the edge of the fastener plate 1 in or more back from the edge of the membrane.
- N. Probe all seams/laps once the hot air welds have thoroughly cooled.
- O. Repair all seam deficiencies the same day they are discovered

3.09 PVC FLASHING MEMBRANE APPLICATION (SENTINEL S BONDING ADHESIVE)

- A. Follow material product data sheets and published general requirements for installation instructions.
- B. Ensure field membrane is fastened and secure to the substrate at all membrane terminations before PVC flashing is installed.
- C. Ensure PVC membrane and substrates are dry, clean and free of asphalt and all bitumen-based products. Do not allow bare PVC to come in contact with asphalt or bitumen-based products.
- D. Where required, cover walls and other flashing substrates using specified wood, gypsum or cement roof boards securely fastened in place.

- E. The ambient temperature shall be above 40°F (4.4°C) during adhesive application. Ensure temperature is well above the dew point temperature to prevent condensation during adhesive application.
- F. Apply SOPREMA SENTINEL S BONDING ADHESIVE using 3/8 in nap solvent resistant rollers to clean, dry and prepared flashing substrates, and onto the underside of the bare PVC membrane. Refer to product data sheet for application rate.
- G. Prevent adhesive from contacting the membrane at the side and end-laps that are to be hot-air welded.
- H. Allow the adhesive on both surfaces to dry to the touch. Adhesive may be tacky to-the-touch, but not wet. Adhesive should not transfer to the finger tips when touched.
- I. Mate the PVC flashing membrane to the flashing substrate. Prevent air entrapment and wrinkles. Apply pressure with hands, roller or broom to ensure complete adhesion.
- J. Hot-air weld all laps with minimum 1-1/2 in welds.
- K. Probe all seams/laps once the hot air welds have thoroughly cooled.
- L. Repair all seam deficiencies the same day they are discovered
- M. Fasten top leading edge of vertical PVC flashings. Refer to detail drawings.

3.10 PVC HOT-AIR WELDING

- A. The Contractor is responsible for project safety. Refer to NRCA CERTA, local codes and building owner's requirements for applicable hot work precautions.
- B. Hot-air welding shall be used to seal PVC flashings and membrane side-laps and end joints watertight.
- C. An automatic welding machine or hand welder shall be used to weld continuous minimum 1-1/2 in welds.
- D. Position the membrane so that it overlaps the adjacent membrane at the required side-lap width. Ensure the side-laps are dry, clean and free of foreign material.
- E. At end-laps of bare PVC membranes, round the corners by cutting a radius on both corners.
- F. SOPREMA T-JOINT PATCHES shall be hot-air welded to the membrane at all T-joint intersections. Chamfer the welding seam prior to installing T-JOINT PATCHES using an edging tool or by heating the edge and rolling.
- G. Probe all seams/laps once the hot air welds have thoroughly cooled.
- H. Repair all seam deficiencies the same day they are discovered

3.11 LIQUID-APPLIED, (PMMA) MEMBRANE AND FLASHING SYSTEM APPLICATION (ALSAN RS LO)

- A. Refer to manufacturer's details drawings, product data sheets and published general requirements for application rates and specific installation instructions.
- B. Pre-cut SOPREMA ALSAN RS FLEECE polyester reinforcing fleece to conform to roof terminations, transitions and penetrations being flashed. Ensure a minimum 2 in overlap of fleece at side and end-laps. Ensure the completed liquid-applied flashing membrane is fully reinforced.
- C. Apply the base coat of catalyzed SOPREMA ALSAN RS resin onto the substrate using a brush or roller, working the material into the surface for complete coverage and full adhesion.
- D. Immediately apply the SOPREMA ALSAN RS FLEECE reinforcing into the wet base coat of resin. Using a brush or roller, work the (SOPREMA ALSAN FLEECE reinforcing fabric into the wet resin while applying the second coat of catalyzed SOPREMA ALSAN RS resin to completely encapsulate the fleece.
- E. Refer to reinforced, polymethacrylate (PMA) specification section and application instructions, details drawings, product data sheets and published general requirements for installation instructions.

3.12 WALKWAYS

- A. At areas outlined on the drawings, and around the perimeter of all rooftop equipment and at all door and stair landings, install walkway protection.
- B. Cut walkway from end of SOPREMA SENTINEL WALK-WAY PAD.
- C. Adhere the center of walkway to the membrane. Mate the membrane to the substrate avoiding any air entrapment or wrinkles. Apply pressure with a roller or push broom to ensure complete bonding.

- D. Hot-air weld the entire perimeter of the SOPREMA SENTINEL WALK-WAY PAD to the membrane.

3.13 CLEAN-UP

- A. Clean-up and properly dispose of waste and debris resulting from these operations each day as required to prevent damages and disruptions to operations.

END OF SECTION



YOUR PROJECT • OUR PRIORITY • NO EXCUSES

Contractor's Authorization for Site Visit Report Distribution

I hereby authorize and require the roofing manufacturer to transmit all site visit reports directly to the Architect of Record via the emails listed below. I agree to enter the email addresses for all parties indicated herein into the manufacturer project warranty registration form. The approved Project Registration Form (PRF) must be included in the submittal package as indicated in section 1 of the applicable roofing specification section.

Manufacturer Name: _____

Authorized Applicator Name: _____

Authorized Agent Name: _____

Authorized Agent Signature: _____

Required Report Distribution

- Direct: Bradford A. Jones, Principal Architect, MP Design Group, bjones@mpdesigngroup.us
- CC: Sarah Williams, Construction Administration Manager, MP Design Group, swilliams@mpdesigngroup.us

SECTION 076200
SHEET METAL FLASHING AND TRIM**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, exterior penetrations, and other items indicated in Schedule.
- B. Sealants for joints within sheet metal fabrications.

1.02 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- D. CDA A4050 - Copper in Architecture - Handbook; Current Edition.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples, 12 by ____ inches (____ by ____ mm) in size, illustrating metal finish color.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS**2.01 SHEET MATERIALS****2.02 PREFINISHED ALUMINUM SHEETS**

- A. Aluminum Sheet Substrates: ASTM B209/B209M, alloy and temper as recommended by manufacturer for application.
- B. Superior Performance Organic Coating System: Comply with AAMA 2605 for aluminum preparation, pretreatment, primer and finish coat system; provide thermally cured 70-percent PVDF fluoropolymer systems; tested for weathering for 10 years with 5 delta units color change maximum.
- C. Application: Trim and wraps.
 - 1. Drawing Detail: As indicated on drawings.
 - 2. Coating System: High-performance organic coating system.
 - 3. Color: Dark Bronze to match Aluminum Store Front System..

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.

- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18-inch (450 mm) long legs; seam for rigidity, seal with sealant.
- F. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.

2.04 ACCESSORIES

- A. Fasteners: Galvanized steel, color matched to finish if concealed isn't possible.
- B. Primer Type: Zinc chromate.
- C. Concealed Sealants: Non-curing butyl sealant.
- D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch (0.38 mm).

3.03 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for field inspection requirements.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 077100
ROOF SPECIALTIES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Manufactured roof specialties, including copings.

1.02 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.
- C. NRCA (RM) - The NRCA Roofing Manual; 2025.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Roof Edge Flashings and Copings:
 - 1. Metal-Era Inc; Perma-Tite Cantilever Coping and Perma-Tite Coping: www.metalera.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 COMPONENTS

- A. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
 - 1. Coping Type 1:
 - a. Snap-on coping with intermittent clips with factory-applied saddle for capping parapet walls with EFIS, brick or panel on wall.
 - b. Does not require exposed fasteners or joint sealants.
 - 2. Coping Type 2:
 - a. Coping with continuous outside and inside cleats for capping parapet walls.
 - b. Does not require exposed fasteners or joint sealants.
- The below apply to both coping type systems.
- 3. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
 - a. Snap-on Coping Cap Sections: Capable of expanding and contracting freely, statically engaged onto mechanically secured clips.
 - b. Snap-on Coping Cap Joints: Underlaid with concealed splices.
- 4. Intermittent Clips:
 - a. Material 16 ga. galvanized steel
 - b. Width: 12" as required / per Manufacturer.
 - c. Fastener Holes: Pre Punched
- 5. Concealed Splices:
 - a. Material: Same as snap on coping cap
 - b. Finish and Color: Same as snap on coping cap
 - c. Width: 8" as required / per manuf.
 - d. Sealant Strips: Factory applied dual non-curing isocryl butyl sealant strips.
- 6. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
- 7. Wall Width: As indicated on drawings.
- 8. Outside Face Height: As indicated on drawings.
- 9. Inside Face Height: As indicated on drawings.
- 10. Material: Formed aluminum sheet, 0.040 inch (1.01 mm) thick, minimum.
- 11. Finish: 70 percent polyvinylidene fluoride.

12. Color: As indicated on drawings.
13. Products:
 - a. Metal-Era Inc; Perma-Tite Cantilever Coping and Perma-Tite Continuous Cleat Coping: www.metalera.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.03 FINISHES

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Seal joints within components when required by component manufacturer.
- C. Anchor components securely.
- D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.
- F. Coordinate installation of flashing flanges into reglets.

END OF SECTION

SECTION 077200
ROOF ACCESSORIES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Roof hatches, manual and automatic operation, including smoke vents.

1.02 REFERENCE STANDARDS

- A. 29 CFR 1910.23 - Ladders; Current Edition.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
 - 1. Non-penetrating Rooftop Supports: Submit design calculations for loadings and spacings.
- D. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS**2.01 ROOF HATCHES AND VENTS, MANUAL AND AUTOMATIC OPERATION**

- A. Roof Hatch Manufacturers:
 - 1. Bilco Company; Type E (ladder access, 3 ft square, solid cover): www.bilco.com/#sle.
 - 2. Or Equal.
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Roof Hatches and Smoke Vents: Factory-assembled aluminum frame and cover, complete with operating and release hardware.
 - 1. Style: Provide flat metal covers unless otherwise indicated.
 - 2. Mounting Substrate: Provide frames and curbs suitable for mounting on corrugated metal roof deck with insulation.
 - 3. Thermally Broken Hatches: Provide insulation within frame and cover.
- C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
 - 1. Material: Mill finished aluminum, 11 gauge, 0.0907 inch (2.3 mm) thick.

2. Insulation: Manufacturer's standard; 1 inch (25 mm) rigid glass fiber, located on outside face of curb.
3. Curb Height: 12 inches (305 mm) from surface of roof deck, minimum.
- D. Metal Covers: Flush, insulated, hollow metal construction.
 1. Capable of supporting 40 psf (1.92 kPa) live load.
 2. Material: Mill finished aluminum; outer cover 11 gauge, 0.0907 inch (2.3 mm) thick, liner 0.04 inch (1.0 mm) thick.
 3. Insulation: Manufacturer's standard 1 inch (25 mm) rigid glass fiber.
 4. Gasket: Neoprene, continuous around cover perimeter.
- E. Safety Railing System: Roof hatch safety rail system mounted directly to curb without penetration of roofing system.
 1. Railing Size: As indicated on drawings.
 2. Railing: Comply with 29 CFR 1910.23 for ladder safety, with a safety factor of two.
 3. Posts and Rails: Galvanized steel tubing.
 4. Gate: Same material as railing; automatic closing with latch.
 5. Finish: Manufacturer's standard, factory applied finish.
 6. Gate Hinges and Post Guides: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper aluminum.
 7. Mounting Brackets: Hot dipped galvanized steel, 1/4 inch (6.4 mm) thick, minimum.
 8. Fasteners: Stainless steel, Type 316.
 9. Products:
 - a. BILCO Company; Bil-Guard 2.0: www.bilco.com/#sle.
 - b. Or Equal.
 - c. Substitutions: See Section 016000 - Product Requirements.
- F. Hardware: Type 316 stainless steel, unless otherwise indicated or required by manufacturer.
 1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf (475 kPa) load.
 2. Hinges: Heavy duty pintle type.
 3. Hold open arm with vinyl-coated handle for manual release.
 4. Latch: Upon closing, engage latch automatically and reset manual release.
 5. Manual Release: Pull handle on interior.
 6. Locking: Padlock hasp on interior.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Engineer/Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

- A. Clean installed work to like-new condition.

3.05 PROTECTION

- A. Protect installed products until completion of project.

- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

**SECTION 078400
FIRESTOPPING****PART 1 GENERAL****1.01 REFERENCE STANDARDS**

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.
- C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2024.
- D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2024.
- E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- F. ITS (DIR) - Directory of Listed Products; Current Edition.
- G. FM (AG) - FM Approval Guide; Current Edition.
- H. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).
- I. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
- J. UL (DIR) - Online Certifications Directory; Current Edition.
- K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Sustainable Design Submittal: Submit VOC content documentation for nonpreformed materials.
- E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.

1.03 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Verification of minimum three years documented experience installing work of this type.

1.04 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Firestopping Materials: Any materials meeting requirements.
- B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- C. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- E. Fire Ratings: Refer to drawings for required systems and ratings.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
 - 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 - 3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
 - 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.
- B. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.03 FIRESTOPPING FOR FLOOR-TO-FLOOR, FLOOR-TO-WALL, HEAD-OF-WALL, AND WALL-TO-WALL JOINTS

- A. Concrete and Concrete Masonry Walls and Floors:
 - 1. Floor-to-Floor Joints:
 - a. 2 Hour Construction: UL System FF-D-1013; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
 - 2. Concrete/Concrete Masonry Wall-to-Wall Joint Systems That Have Movement Capabilities (Dynamic-D):
 - a. 2 Hour Construction: UL System WW-D-0017; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
 - b. 2 Hour Construction: UL System WW-D-0032; Hilti CP 606 Flexible Firestop Sealant.
- B. Gypsum Board Walls:
 - 1. Wall-to-Wall Joints That Have Movement Capabilities (Dynamic-D):
 - a. 2 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
 - b. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.

2.04 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

- A. Blank Openings:
 - 1. In Floors or Walls:
- B. Penetrations Through Floors or Walls By:
 - 1. Multiple Penetrations in Large Openings:
 - a. 2 Hour Construction: UL System C-AJ-8143; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - 2. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System C-AJ-2167; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - 3. Electrical Cables Not In Conduit:
 - a. 2 Hour Construction: UL System C-AJ-3216; Hilti CFS-PL Firestop Plug.
 - 4. Cable Trays with Electrical Cables:
 - a. 2 Hour Construction: UL System C-AJ-4094; Hilti CFS-BL Firestop Block.

5. Insulated Pipes:
 - a. 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE IMAX Intumescent Firestop Sealant.
- C. Penetrations Through Walls By:
 1. Uninsulated Metallic Pipe, Conduit, and Tubing:
 2. Electrical Cables Not In Conduit:
 - a. 2 Hour Construction: UL System C-AJ-3095; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 3. Insulated Pipes:
 - a. 2 Hour Construction: UL System C-AJ-5090; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.05 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

- A. Blank Openings:
 1. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.

2.06 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
 1. Fire Ratings: See drawings for required systems and ratings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

3.04 FIELD QUALITY CONTROL

- A. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 079200
JOINT SEALANTS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Each form and type of joint sealants.
- B. Applications for joint sealers.
- C. Self-leveling pourable joint sealants.
- D. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 079100 - Preformed Joint Seals: Precompressed foam, gaskets, and strip seals.

1.03 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- D. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.
- E. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Backing material recommended by sealant manufacturer.
 - 4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 5. Substrates the product should not be used on.
 - 6. Substrates for which use of primer is required.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Samples for Verification: Where custom sealant color is specified, obtain directions from Engineer/Architect and submit at least two physical samples for verification of color of each required sealant.
- F. Duplicate samples may be required. See section 016000 Product Requirements.
- G. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.
- C. Field Adhesion Test Procedures:
 - 1. Allow sealants to fully cure as recommended by manufacturer before testing.
 - 2. Have a copy of the test method document available during tests.

3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
4. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Engineer/Architect.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Nonsag Sealants:
 1. Bostik Inc; <>: www.bostik-us.com/#sle.
 2. Dow Chemical Company; <>: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 3. Hilti, Inc; <>: www.us.hilti.com/#sle.
 4. Momentive Performance Materials, Inc (formerly GE Silicones); <>: www.momentive.com/#sle.
 5. Sika Corporation; <>: www.usa-sika.com/#sle.
 6. Or Equal.
 7. Substitutions: See Section 016000 - Product Requirements.
- B. Self-Leveling Sealants:
 1. Adhesives Technology Corporation; <>: www.atcepoxy.com/#sle.
 2. Bostik Inc; <>: www.bostik-us.com/#sle.
 3. Dow Chemical Company; <>: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 4. Sika Corporation; <>: www.usa-sika.com/#sle.
 5. Or Equal.
 6. Substitutions: See Section 016000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

- A. Scope:
- B. Exterior Joints: Use nonsag non-staining silicone sealant, unless otherwise indicated.
- C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
 1. Wall and Ceiling Joints in Wet Areas: Nonsag polyurethane sealant for continuous liquid immersion.
 2. Floor Joints in Wet Areas: Nonsag polyurethane non-traffic-grade sealant suitable for continuous liquid immersion.
 3. Joints between Tile in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
 4. Other Floor Joints: Non-sag polyurethane non-traffic-grade sealant.
- D. Interior wet areas Include but are not limited to: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.
- E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.
- F. Areas Where Tamper-Resistance is Required: As indicated on drawings.

2.03 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.
- B. Colors: As indicated on the drawings or as selected from Manufacturer's standard colors.
- C. Select materials for compatibility and select elasticity and hardness based on Manufacturer's recommendations for application intended.

2.04 JOINT SEALANTS

- A. Type 1 - Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 1. Movement Capability: Plus and minus 50 percent, minimum.

2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 4. Color: To be selected by Engineer/Architect from manufacturer's full range.
- B. Type 2 Interior Wet Areas -Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component Type S, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White.
 2. Products:
 - a. Sika Corporation; Sikasil GP: usa.sika.com/#sle.
 - b. Or Equal.
 - c. Substitutions: See Section 016000 - Product Requirements.
- C. Type 3 - Tamper-Resistant, Silyl-Terminated Polyether (STPE) and Polyurethane (STPU) Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
1. Scope: Interior application or wherever there is potential for an inmate to have access or interaction with a sealant it must be a tamper resistant security sealant type.
 - a. Window and door perimeter joints
 - b. protrusions and penetrations
 - c. vents
 - d. around fixtures and other interior joints or openings of any kind
 - e. e.polycarbonate sheet for interior security glazing unless glazing mfg requires another product for warranty purposes
 2. Movement Capability: Plus and minus ____ percent, minimum
 3. Hardness Range: 25 to 30, Shore A, when tested in accordance with ASTM C661.
 4. Color: To be selected by Engineer/Architect from manufacturer's standard range.
 5. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).
 6. Products:
 - a. Pecora Corporation; DynaFlex SC (Security Sealant): www.pecora.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- D. Type 4 - Noncuring Butyl Sealant: Solvent-based, single component, nonsag, nonskinning, nonhardening, nonbleeding; nonvapor permeable; intended for fully concealed applications.
- E. Type 5 Exterior Concealed Joints between two assembled rigid surfaces in compression: Polyisobutylene sealant tape conforming to AAMA 804.1.
- F. Type 6 Acoustical Sealant: Nonskinning, nonhardening, permanently flexible sealant specifically designed for sealing gypsum wallboard.
- G. Type 7 Foam Sealants: Equal to Styrofoam Brand Sill Seal Foam Gasket; provide in width required for Metal Stud Sizes.

2.05 TAMPER-RESISTANT, TWO COMPONENT 1:1 EPOXY SYSTEM FOR USE IN CONCRETE AND CONCRETE MASONRY BLOCK

- A. A.Scope: Interior concrete/CMU wall crack repair wherever there is potential for an inmate to have access or interaction with a sealant it must be a tamper resistant security sealant type.
1. Bonding agent for building materials including, concrete, block, stone, steel and other substrates.
 2. 2.High-build, non-sag patching material for non-moving cracks and spalls.
- B. The concrete repair adhesive shall be a two-component, 1:1 mix ratio epoxy system supplied in premeasured containers. When cured 7 days and at a minimum temperature of 75 °F (24 °C), shall have a minimum compressive yield strength of 13,850 psi (95.5 MPa) and a minimum compressive modulus of 743,300 psi (5,125 MPa) per ASTM D695. The concrete repair adhesive shall be CRACKBOND EPOXY REPAIR PASTE from Adhesives Technology Corp., Pompano Beach, Florida or equal.

2.06 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod, polyethylene-jacketed polyurethane foam, butyl rubber foam, neoprene foam, or other flexible, permanent, durable non abrasive material with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- D. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.
- E. Fiber Expansion Joint Material: Preformed cellular fiber complying with ASTM D1751.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.
- D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
 - 1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
 - 2. Notify Engineer/Architect of date and time that tests will be performed, at least seven days in advance.
 - 3. Record each test on Preinstallation Adhesion Test Log as indicated.
 - 4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Engineer/Architect.
 - 5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces. Clean adjacent surfaces to eliminate evidence of spillage.
- F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

- H. Dure sealants and caulking compounds in compliance with Manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability.
- I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

- A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Hollow metal frames for wood doors.
- B. Fire-rated hollow metal doors and frames.
- C. Hurricane-resistant hollow metal doors and frames.

1.02 RELATED REQUIREMENTS

- A. Section 087100 - Door Hardware.
- B. Section 088000 - Glazing: Glass for doors and borrowed lites.
- C. Section 099123 - Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.
- E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- G. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- H. ASTM C476 - Standard Specification for Grout for Masonry; 2019.
- I. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
- J. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.
- K. FBC TAS 201 - Impact Test Procedures; Testing Application Standard; 1994.
- L. FBC TAS 202 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure; Testing Application Standard; 1994.
- M. FBC TAS 203 - Criteria for Testing Products Subject To Cyclic Wind Pressure Loading; Testing Application Standard; 1994.
- N. FLA (PAD) - Florida Building Code Online - Product Approval Directory; Current Edition.
- O. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- P. Miami (APD) - Approved Products Directory; Miami-Dade County; Current Edition.
- Q. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- R. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2024.
- S. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.
- T. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames; 2018.
- U. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- V. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any. Provide schedule of doors and frames using same reference numbers for openings as those on drawings.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements for small and large missile impact requirements for exterior doors and frames.

1.05 QUALITY ASSURANCE

- A. Maintain at project site copies of reference standards relating to installation of products specified.
- B. Provide hollow metal frames complying with ANSI A250.8 (SDI-100) Recommended Specifications for Standard Steel Doors and Frames.
- C. Provide each type of door and frame unit from a single manufacturer specializing in manufacturing of that type of work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.
- C. Inspect hollow metal doors and frames upon delivery for damage. Minor damage may be repaired, if repair work is equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- D. Store doors and frames under a covered protected area, placed on wood sills at least 4 inches off of ground surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
 - 2. Republic Doors: www.republicdoor.com.
 - 3. Steelcraft, an Allegion brand: www.allegion.com/us.
 - 4. Curries Company.
 - 5. Adams Rite
 - 6. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Materials:
 - 1. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, complying with ASTM A569 and ASTM A568.
 - 2. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A366 and ASTM A568.
 - 3. Inserts, Anchors Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A153 Class C or D as applicable.
- B. Requirements for All Doors and Frames:
 - 1. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 2. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
 - a. Reinforce top and bottom of doors with a continuous steel channel extending the full width of the door and welded to the face sheet. Doors with an inverted channel to include a steel closure channel, screw attached and welded in place with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable

3. Door Edge Profile: Hinged edge square, and lock edge beveled.
4. Typical Door Face Sheets: Flush.
5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 - a. Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.
 - b. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.
 - c. Locate finish hardware as shown on final shop drawings or, if not shown, in accordance with "Recommended Locations for Builder's Hardware", published by Door and Hardware Institute.
7. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
 - a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive and exterior locations.
- C. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm). Plastic or composite channel fillers are not acceptable.
- D. Top/Bottom Edges: Reinforce top and bottom of doors with a continuous steel channel extending the full width of the door and welded to the face sheet. Doors with an inverted channel to include a steel closure channel, screw attached and welded in place with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
- E. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished. Must be sprayed with two (2) final coats.
- B. Interior Doors, Non-Fire Rated:
 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B 500 000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 18 gage, 0.042 inch (1.0 mm), minimum.
 - e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
 - 1) Provide at doors in wet areas and/or as called for in the schedule.
 2. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
- C. Hurricane Resistant Doors:
 1. Comply with Florida Building Code (FBC) test protocols for High Velocity Hurricane Zone (HVHZ) FBC TAS 201, FBC TAS 202 and FBC TAS 203.
 2. Design and size door and frame components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M.
 - a. Design Wind Loads: Comply with requirements of ASCE 7.
 - b. Wind-Borne Debris Resistance: Door and frame components shall have FLA (PAD) approval or Miami (APD) approval for Large and Small Missile impact and pressure cycling at design wind loads.

3. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
4. Core Material: Polystyrene.
5. Door Thermal Resistance: R-Value of 6.0 minimum, for installed thickness of polystyrene.
6. Door Thickness: 1-3/4 inches (44.5 mm), nominal.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory primed and field finished. Must be sprayed with two (2) final coats.
- C. General:
 1. Provide floor anchors at each jamb and mullion in addition to required wall anchors.
- D. Exterior Door Frames: Fully welded and mitered corners with concealed fastenings.
 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvanized) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
 2. Frame Metal Thickness: 14 gage, 0.067 inch (1.7 mm), minimum.
 3. Weatherstripping: Separate, see Section 087100.
 4. Wind-Borne Debris Resistance: Door and frame components shall have Miami (APD) approval for Large and Small Missile impact and pressure cycling at design wind loads.
- E. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 1. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
 2. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvanized) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
 - a. Provide at doors in wet areas and/or as called for in the schedule.
- F. Door Frames, Fire-Rated: Full profile/continuously welded type.
 1. Fire Rating: Same as door, labeled.
 2. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
- G. Hurricane-Resistant Door Frames: With same hurricane resistance as door; face welded or full profile/continuously welded construction, ground smooth, fully prepared and reinforced for hardware installation.
 1. Frame Metal Thickness: 14 gage, 0.067 inch (1.7 mm), minimum.
- H. Mullions for Pairs of Doors: Fixed, except where removable is indicated, with profile similar to jambs.
- I. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- J. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inch high (102 mm high) to fill opening without cutting masonry units.
- K. Frames Wider than 48 inches (1219 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

- A. Glazing: As specified in Section 088000, factory installed.
- B. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches (102 mm) as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- C. Silencers: Resilient rubber or vinyl, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

- D. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.07 FABRICATION

A. General

1. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site.
2. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel.
3. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).
4. Fabricate doors indicated to be galvanized from galvanized sheet steel. Close top and bottom edges as integral part of door construction or by addition of inverted galvanized steel channels.
5. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

2.08 FINISHES

- A. Shop Paint: Clean treat and paint exposed surfaces of steel door and frame units. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign matter before applying paint. Provide shop coat of prime paint of even consistency to provide a uniform finish surface ready to receive final coats. Prior to application of any hardware components apply finish coat of paint.
1. Finish coats of paint on doors shall be shop applied.
 2. Finish coat on frames may be field applied.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install frames prior to construction of enclosing walls and ceilings.
- C. Coordinate frame anchor placement with wall construction. Locate 3 wall anchors, of type suitable for construction type, per jamb at hinge and strike levels. Locate floor anchor at each jamb and mullion.
- D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Install door hardware as specified in Section 087100.
- F. Coordinate installation of electrical connections to electrical hardware items.
- G. Touch up damaged factory finishes.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

- A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 081416
FLUSH WOOD DOORS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Pre-finished solid core wood doors; flush configuration with veneer faces; fire rated and non-rated.

1.02 REFERENCE STANDARDS

- A. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- B. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
- C. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- D. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, extent of blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- D. Samples: Submit two samples of door veneer, 12 by 12 inch (____ by ____ mm) in size illustrating wood grain, stain color, and sheen.
- E. Duplicate samples may be required. See section 016000 Product Requirements.
- F. Manufacturer's Installation Instructions: Indicate special installation instructions.
- G. Warranty, executed in Owner's name.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
- B. Installed Fire Rated Door and Transom Panel Assembly: Conform to NFPA 80 for fire-rating as scheduled. Provide label of an approved nationally recognized independent testing laboratory on each door.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging [<>]. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for 2 years.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, and defective materials.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Wood Veneer Faced Doors:
 - 1. VT Industries, Inc; ____: www.vtindustries.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 DOORS

- A. Doors: See drawings for locations and additional requirements.

1. Quality Standard: Custom Grade, Standard Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
1. Provide solid core doors at all locations.
 2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with NFPA 252 or UL 10B - Negative (Neutral) Pressure; Underwriters Laboratories Inc. (UL) or Intertek/Warnock Hersey (WHI) labeled .

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated. ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde resin.
- B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: White birch, HPVA Grade AA, rotary cut, with book match between leaves of veneer, center balance match of spliced veneer leaves assembled on door or panel face.
1. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet (3 m) of each other when doors are closed.

2.05 ACCESSORIES

- A. Glazing Stops: Wood, of same species as door facing, mitered corners; prepared for countersink style screws for non rated doors. Aluminum channel shaped for rated doors.

2.06 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. For fire rated doors comply with requirements of NFPA 80.
- C. Factory cut and trim openings. Trim openings for non fire rated doors with manufacturer's stock solid wood moldings to match door finish.
- D. Factory cut openings for grilles as scheduled or indicated in Mechanical Drawings and Division 23.
- E. Cores Constructed with stiles and rails:
1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
 2. Provide solid blocking for other throughbolted hardware.
- F. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- G. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- H. Provide edge clearances in accordance with the quality standard specified.

2.07 FINISHES - WOOD VENEER DOORS

- A. Finish work in accordance with WDMA I.S. 1A for Grade specified and as follows:
1. Transparent:
 - a. System - TR-6, Catalyzed Polyurethane.
 - b. Stain: Ravine
 - c. Sheen: Satin.
- B. Factory finish doors in accordance with approved sample.
1. If on site sanding or removal of seal of top and bottom edge occurs, re-seal top and bottom edges with sealer to match door facing
- C. Seal door top edge and bottom edge with color sealer to match door facing. Finish all faces of door.

- D. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Installer must examine door frames and verify that frames are correct type and have been installed as required for proper hanging of corresponding doors.
- D. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Condition doors to average prevailing humidity in installation area prior to hanging doors. Building shall be fully enclosed and have permanent climate control system operating.
- B. Install doors in accordance with manufacturer's instructions and specified quality standard.
 - 1. Install fire-rated doors in accordance with NFPA 80 requirements.
- C. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- D. Use machine tools to cut or drill for hardware.
- E. Coordinate installation of doors with installation of frames and hardware.
- F. Coordinate installation of glazing.
- G. Install door louvers plumb and level.
 - 1. Coordinate location of louvers with other scheduled door hardware including but not limited to mop plates, kickplates and operating hardware.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.
- C. Rehang and replace doors which do not swing or operate freely and properly.

3.05 PROTECTION

- A. Protect installed wood doors from damage or deterioration until acceptance of work at Substantial Completion.

END OF SECTION

SECTION 083100
ACCESS DOORS AND PANELS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Wall-mounted access units.
- B. Ceiling-mounted access units.

1.02 REFERENCE STANDARDS**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of each access door and/or panel unit.
- D. Manufacturer's Installation Instructions: Indicate installation requirements.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Package and ship per manufacturer's recommendations.
- B. Store per manufacturer's instructions.
 - 1. Store in dry area out of direct sunlight.

1.06 WARRANTY

- A. Provide manufacturer's written warranty.
- B. Warrant materials and fabrication against defects after completion and final acceptance of Work.
 - 1. Repair defects, or replace with new materials, faulty materials or fabrication developed during the warranty period at no expense to Owner.

PART 2 PRODUCTS**2.01 ACCESS DOORS AND PANELS ASSEMBLIES**

- A. Ceiling-Mounted Units Standard:
 - 1. Location: As indicated on drawings.
 - 2. Panel Material: Paintable finish to match adjacent ceiling.
 - 3. Door/Panel: Hinged, standard duty, with keyed tool-operated spring or cam lock and no handle.
- B. Ceiling - Mounted Security Access panel:
 - 1. Location: In Secure Ceiling Assembly Systems, see drawings for locations.
 - 2. Panel material: Stainless Steel
 - 3. Size: 24x24
 - 4. Door/ Panel: Concealed Continuous Piano Hinge, with Keyed secure lock and no handle. Exposed Flange.
- C. Wall-Mounted Security Units:
 - 1. Location: As indicated on drawings.
 - 2. Size: 12 by 12 inches (305 by 305 mm).
 - 3. Size: As called for in the drawings.
 - 4. Door/Panel and Frame: Heavy duty.
 - 5. Security type lock as indicated.

2.02 CEILING-MOUNTED UNITS

- A. Manufacturers:
 - 1. Nystrom, Inc; Architectural Access Door and Medium Security Access Doors:
www.nystrom.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Medium Security Secure Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Material: Cold Rolled Steel Sheet
 - 2. Style: Face of Door flush with frame, with exposed flange and concealed continuous piano hinge.
 - a. Exposed flange. Secure to Secure ceiling system support / T bar system.
 - 3. Door Style: 12 gauge
 - 4. Frames: 12
 - 5. Door Finish: Stainless Steel
 - 6. Door/ panel Size: As indicated on the drawings.
 - 7. Hardware:
 - a. Concealed continuous piano hinge
 - b. Handle: no handle
 - c. Latch/lock: key operated, no handle. Anti-ligature.
- C. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Material: Cold Rolled Steel.
 - 2. Style: Frame concealed by door panel.
 - a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
 - 3. Door Style: 16 gauge cold rolled steel.
 - 4. Frames: 16 gauge, 0.0598 inch (1.52 mm), minimum cold rolled steel.
 - 5. Heavy-Duty Single Steel Sheet Door Panels: 14-gauge, 0.0747-inch (1.89 mm) minimum thickness.
 - 6. Primed and Factory Finish: Polyester powder coat; white powder coat.
 - 7. Door/Panel Size: As indicated on the drawings.
 - 8. Hardware:
 - a. Hinges for Non-Fire-Rated Units: Concealed Continuous Piano Hinge.
 - b. Handle: No handle.
 - c. Latch/Lock: Key operated cam latch, two keys for each unit.

2.03 FABRICATION

- A. Manufacture each access panel assembly as an integral unit ready for installation.
- B. Welded construction: Furnish with a sufficient quantity of 1/4 inch mounting holes to secure access panels to types of supports indicated.
- C. Recessed panel: Form face of panel to provide specified recess for application of finish material. Reinforce panel as required to prevent buckling.
- D. Furnish number of latches required to hold door in flush, smooth plane when closed.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that rough openings are correctly sized and located.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

3.04 ADJUSTING AND CLEANING

- A. Adjust panel after installation for proper operation.
- B. Remove and replace panels or frames that are warped, bowed, or damaged.

END OF SECTION

SECTION 083323
OVERHEAD COILING DOORS - OVERHEAD DOOR

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Overhead coiling service doors.

1.02 RELATED REQUIREMENTS

- A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 260583 - Wiring Connections: Power to disconnect.

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- C. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- D. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
- E. FBC TAS 201 - Impact Test Procedures; Testing Application Standard; 1994.
- F. FBC TAS 202 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure; Testing Application Standard; 1994.
- G. ICC (IECC)-2018 - International Energy Conservation Code; 2018.
- H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- I. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.
- C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.
- D. Manufacturer's Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.
- G. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.
- H. Specimen warranty.
- I. Executed warranty.
- J. Project Record Documents: Include as-built electrical diagrams for electrical operation and connection to fire alarm system.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of this section with minimum of 5 years of documented experience in fabrication and installation of security closures.
- B. Installer Qualifications: Company specializing in performing work of this section with minimum of 3 years of documented experience and approved by manufacturer.

- C. Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Protect materials from exposure to moisture.
- D. Store materials in dry, warm, ventilated, weathertight location.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Door and Operator Warranty: Provide manufacturer's limited warranty for door and operator system free from material and workmanship defects for duration and cycles indicated under individual doors; counterbalance spring and finish not covered by warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Overhead Door Corporation: www.overheaddoor.com/#sle.
- B. Substitutions: See Section 016000 - Product Requirements.

2.02 OVERHEAD COILING SERVICE DOORS

- A. : Overhead Door Corporation; Model 625 Insulated Stormtite.
 - 1. Slats: Insulated, interlocking, roll-formed, metal slats.
 - 2. Width: As Scheduled in the Drawings.
 - 3. Height: As Scheduled in the Drawings.
 - 4. Mounting: Surface-mounted on side indicated on drawings.
 - 5. Opening Speed: Door to operate at variable speed of 6 to 12 inches (152 to 305 mm) per second.
 - 6. Closing Speed: Door to operate at variable speed of 6 to 12 inches (152 to 305 mm) per second.
 - 7. Operation Cycles: Capable of operating for minimum 20,000 cycles. One operation cycle is complete when door is opened from closed position to fully open position and returned to closed position.
 - 8. Available Warranty:
 - a. Door Only: Two years.
 - b. Door and Operator Warranty: Three years or 20,000 cycles, whichever comes first.
 - 9. Wind Load: Design Door assembly to withstand ultimate static pressure load and requirements for location in accordance with ASTM E330/E330M.
 - 10. Impact Rating: Available with certification for large missile impact resistant for project install location.
 - a. Submit testing approval and criteria.
 - 11. Curtain Material:
 - a. Front Slat:
 - 1) Galvanized Steel: 24 gauge, 0.278 inch (0.63 mm).
 - b. Back Slat:
 - 1) Galvanized Steel: 24 gauge, 0.278 inch (0.63 mm).
 - c. Slat Profile: F-265i.
 - d. Slat R-Value: R-value (RSI-value): 7.7 (1.35).
 - e. Through Curtain Sound Rating: STC-28 in accordance with ASTM E90; STC-30 minimum, with hertz noise generator.
 - f. Installed System Sound Rating: STC-21 in accordance with ASTM E90.
 - g. U-Factor: 0.91 NFRC test report; maximum U-factor of maximum 1.00.
 - h. Vision Lites: Not required.
 - 12. Bottom Bar: 6063-T6 aluminum.
 - a. Profile: Double angle.
 - b. Finish: Mill finish.
 - 13. Locking Options to Include: Slide lock.

- a. Lock Locations: Right only.
- b. Lock Access: Coil side.
- 14. Weatherstripping and Seals:
 - a. Bottom Seal Astragal: Included.
 - b. Exterior Guide Seal: Required.
 - c. Interior Guide Seal: Required.
 - d. Internal Hood Seal: Included.
 - e. Lintel Brush Seal: Required.
- 15. Side Guides, Channels: Constructed of steel with members fully bolted together.
 - a. Finish: PowderGuard Premium powder coat.
 - 1) Color: Black.
- 16. Brackets: Steel to support counterbalance and curtain.
 - a. Finish: Match curtain.
- 17. Counterbalance: Helical torsion spring type, housed in steel tube or pipe barrel and supporting curtain with deflection limited to 0.03 inch per foot (1:400 mm/sec) of span. Adjustable spring tension required.
- 18. Hood: 24 gauge, 0.0278 inch galvanized steel (0.63 mm galvanized steel).
 - a. Finish: Match curtain.
- 19. Manual Operation: Chain hoist.
- 20. Motor Operation: Provide UL-listed electric operator; size as recommended by manufacturer to move door in either direction at minimum 8 inches (203 mm), maximum 1 foot (305 mm) per second.
 - a. Manual Override: Hoist.
 - b. Timer to Close: Automatic closing controlled by adjustable hold-open time delay.
 - c. Operation Supply Voltage: 208/230/460V 3 phase 60Hz.
 - 1) 460V 3 Phase; See electrical
 - d. Signaling Device: Horn and strobe combination.
 - e. Actuation Device: Provide push button, key switch, pull cord, loop detector, motion detector, treadle switch, and radio control.
 - f. Motor Mounting: Wall mounted, right hand side.
 - g. Motor Enclosure: NEMA 4-12 watertight and oiltight.
 - h. Obstruction Safety Detection:
 - 1) Primary, Monitored: Reflective photo-eyes.

2.03 OVERHEAD COILING SHEET DOORS

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions meet manufacturer's requirements before starting work.
- B. Verify opening sizes, tolerances, and conditions are acceptable.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's written instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building structure without distortion or stress.
- C. Securely and rigidly brace components suspended from structure.
- D. Fit and align assembly, including hardware. Level and plumb to provide smooth operation.
- E. Coordinate installation of electrical service; see Section 260583.
- F. Install enclosure and perimeter trim.

3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation from Plumb: 1/16 inch (1.6 mm).

- C. Maximum Variation from Level: 1/16 inch (1.6 mm).
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet (3.2 mm per 3 m) straight edge.

3.04 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Clean installed components.
- C. Remove labels and visible markings.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch up damaged finishes after Date of Substantial Completion.

END OF SECTION

SECTION 083613
SECTIONAL DOORS - OVERHEAD DOOR**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Overhead sectional steel doors.

1.02 REFERENCE STANDARDS**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.
- C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.
- D. Manufacturer's Installation Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.
- E. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.
- F. Specimen warranty.
- G. Executed warranty.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum 5 years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with minimum 3 years of documented experience.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty for counterbalance shaft assembly for years indicated under individual doors. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Overhead Door Corporation; _____: www.overheaddoor.com/#sle.
 - 1. Substitutions: See Section 016000 - Product Requirements.

2.02 OVERHEAD SECTIONAL STEEL DOORS

- A. Thermacore Steel Sectional Doors: Overhead Door Corporation; Model 591.
 - 1. Panels: Steel construction with exterior sheet, interior sheet, and core reinforcement.
 - 2. Width: As Scheduled.
 - 3. Height: As Scheduled.
 - 4. Mounting: Surface mounted on interior of building.
 - 5. Opening Speed: Door to operate at variable speed of 6 to 12 inches (152 to 305 mm) per second.
 - 6. Closing Speed: Door to operate at variable speed of 6 to 12 inches (152 to 305 mm) per second.
 - 7. Air Infiltration at 25 mph (40 km/hr): 0.08 cfm/sq ft (1.46 cu m/hr/sq m).
 - 8. U-Factor: 0.13.
 - 9. R-value (RSI-value): 14.86 (2.63).
 - 10. STC Rating: Not applicable.
 - 11. Operation Cycles: Capable of operating for minimum 10,000 cycles. One operation cycle is complete when door is opened from closed position to fully open position and returned to closed position.
 - 12. Available Warranty:

- a. Door Only: One year.
- 13. Panel Material:
 - a. Exterior Steel Thickness: 0.015 inch (0.38 mm) galvanized steel.
 - b. Panel Thickness: 1-5/8 inches (41 mm).
 - c. Joint Profile: Tongue and groove.
 - d. Section Height: Manufacturer's standard based on door height.
 - e. Exterior Surface Profile: Ribbed.
 - f. Lites: Not required.
 - g. Exterior Finish: White.
- 14. Locking Options to Include: Cylinder.
 - a. Lock Locations: Left only.
 - 1) Left from inside (generally beside each man door)
- 15. Weatherstripping and Seals: Required.
- 16. Tracks: Constructed of steel with members fully bolted together.
 - a. Size: 2 inches (51 mm).
 - b. Finish: Mill finish.
- 17. End Stiles: 14 gauge, 0.0785 inch (1.99 mm) galvanized steel.
- 18. Brackets: Steel to support counterbalance and curtain.
 - a. Finish: Hot-dip galvanized.
- 19. Springs: Rated for 10,000 cycles.
- 20. Manual Operation: Chain hoist.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

3.02 PREPARATION

- A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.
- B. Apply primer to wood frame.

3.03 INSTALLATION

- A. Install door unit assembly in accordance with manufacturer's instructions.
- B. Anchor assembly to wall construction and building framing without distortion or stress.
- C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- D. Fit and align door assembly including hardware.

3.04 TOLERANCES

- A. Maximum Variation from Plumb: 1/16 inch (1.5 mm).
- B. Maximum Variation from Level: 1/16 inch (1.5 mm).
- C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch in 10 feet (3 mm in 3 m) straight edge.
- D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

- A. Adjust door assembly for smooth operation and full contact with weatherstripping.

3.06 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Clean doors and frames and glazing.
- C. Remove temporary labels and visible markings.

3.07 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

- B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.

1.02 RELATED REQUIREMENTS

- A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 088000 - Glazing: Glass and glazing accessories.
- C. Section 092116 - Gypsum Board Assemblies.

1.03 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.
- C. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- D. AAMA 612 - Voluntary Specification, Performance Requirements, and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum; 2020, with Errata (2022).
- E. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- G. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- J. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- K. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
- L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
- M. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2023.
- N. Miami (APD) - Approved Products Directory; Miami-Dade County; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details.

- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
 - 1. Indicate system dimensions, framed opening requirements and tolerances, anticipated deflection under load, affected related work, weep drainage network, expansion and contraction joint location and details, and field welding required.
 - 2. Provide full elevations at a minimum scale of 1/4 inch to 1 foot.
 - 3. Provide full-size joint details illustrating details including flashing.
 - 4. Indicate means of adjustment to accommodate field conditions.
 - 5. Indicate locations and details for attachment of components to building structure including but not limited to masonry, concrete, primary steel, and secondary steel.
- D. Samples: Submit two samples 18 by 18 inches (____by____ mm) in size illustrating finished aluminum surface, glass, glazing materials.
 - 1. Submit manufacturer's samples indicating quality of finish in required colors.
 - 2. Where normal texture or color variations are expected, include additional samples illustrating range of variation.
- E. Duplicate samples may be required. See section 016000 Product Requirements.
- F. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- G. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- H. Wind Borne Region (Hurricane Impact Resistance) Proof of Compliance:
 - 1. Provide documentation stating the aluminum storefront system provided for installation complies with the requirements of the local adopted building code and version of ASCE for the project's specific location.
 - 2. Provide the following for the specific system to be installed, which shall be based on the minimum requirements of the local adopted building code and version of ASCE for the project's specific location.
 - a. Negative Design Wind Load in lbf/sq ft.
 - b. Positive Design Wind Load in lbf/sq ft.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least 5 years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least 5 years of documented experience. Installer must be approved and certified in writing by the system manufacturer for quality installation performance of specified systems.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

1. Discoloration, fading, chalking, staining, pitting, corrosion, or other deterioration or inconsistency in finish surface.
2. Aging or weathering that does not match extra materials in storage.
3. Penetration of water into the building exceeding specified limits.
4. Air infiltration exceeding specified limits.
5. Structural failure of components resulting from forces within specified limits.
6. Failure of operating parts to function normally.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

- A. Center-Set Style, Wind-Borne-Debris Resistance Tested:
 1. Basis of Design: Kawneer IR 500 <>.
- B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
 1. Coral Architectural Products, a division of Coral Industries, Inc; ____: www.coralap.com/#sle.
 2. EFCO, a Pella Company; <>: www.efcocorp.com/sle.
 3. YKK AP America Inc; <>: www.ykkap.com.
 4. Or Equal.
- C. Substitutions: See Section 016000 - Product Requirements.
 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 BASIS OF DESIGN -- SWINGING DOORS

- A. Wind-Borne-Debris Resistance Tested:
 1. Basis of Design: Kawneer 500 IR.
- B. Medium Style, Monolithic Glazing:
 1. Thickness: 1-3/4 inches (43 mm).
- C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
 1. EFCO, a Pella Company; <>: www.efcocorp.com/sle.
 2. YKK AP America Inc; <>: www.ykkap.com.
 3. Oldcastle Building Envelope: www.obe.com.

2.03 BASIS OF DESIGN - INTERIOR ALUMINUM STOREFRONT SYSTEM.

- A. Center-Set Style, Interior Framing System.
 1. Basis of Design: Kawneer - Trifab 400 Framing System.
- B. System Dimensions: 1 3/4"x 4".
- C. Substitutions: See Section 01600 - Product Requirements.
 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.04 ALUMINUM-FRAMED STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 1. Unitized, shop assembly.
 2. Glazing Rabbet: For 1-5/16" inch (____ mm) insulating glazing.
 3. Finish: Pigmented organic coatings.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
 - c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
 4. Finish Color: Dark bronze.
 5. Finish Color: As selected by Architect from manufacturer's standard line.

6. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 7. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 8. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 9. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
 10. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 11. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 12. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel, and heel bead of glazing compound.
 13. Gaskets: Glazing gaskets for flush glazing shall comply with ASTM C864 and be extruded of a silicone compatible EPDM rubber that provides for silicone adhesion.
- B. Performance Requirements
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Design Wind Loads: Comply with requirements of ASCE 7.
 - b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
 2. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, having Florida Building Code FLA (PAD) approval for Large and Small Missile impact and pressure cycling at design wind pressure.
 3. Air Leakage: 0.06 cfm/sq ft (0.3 L/sec sq m) maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf (75 Pa) pressure difference.

2.05 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
1. Framing members for interior applications need not be thermally broken.
 2. Glazing Stops: Flush.
 3. Cross-Section: 2.5x5 inch (____x____ mm) nominal dimension.
- B. Glazing: See Section 088000.
- C. Snap Trims and Clips.
1. Provide snap trim and clips by Aluminum Storefront Manufacturer.
 2. Color: Provide in same color as ASF frame system.
 3. Locations: As called for in the drawings.
- D. Swing Doors: Glazed aluminum.
1. Thickness: 1-3/4 inches (43 mm).
 2. Top Rail: 3.5 inches (____ mm) wide.
 3. Vertical Stiles: 3.5 inches (____ mm) wide.
 4. Bottom Rail: 6.5 inches (____ mm) wide.
 5. Glazing Stops: Shall be hook-in type with EPDM glazing gaskets reinforced with non-stretchable cord.
 6. All glazing shall be flush, including the horizontal muntins and sills. Glass shall be held in place by EPDM glazing gaskets on both sides. No applied stops shall be permitted.
 7. Finish: Same as storefront.

2.06 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209/B209M.
- C. Fasteners: Stainless steel.
- D. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch (0.81 mm) minimum thickness; finish to match framing members.
- E. Concealed Flashings: Sheet aluminum, 26 gauge, 0.017 inch (0.43 mm) minimum thickness.
- F. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.
- G. Sealant for Setting Thresholds: Non-curing butyl type.
- H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.07 FINISHES

- A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch (0.030 mm).
- B. Color: Dark Bronze.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.08 HARDWARE

- A. For each door, include weatherstripping, sill sweep strip, and threshold (ADA compliant locking type). Sill sweep to be resilient neoprene type and not brush.
- B. Hardware must coordinate and be in full compliance with the submitted system's tested wind borne debris application requirements.
- C. Other Door Hardware: Storefront manufacturer's standard type to suit application.
 - 1. Coordination during the bidding phase with Section 087100 is required and any discrepancies or complications with the hardware specified therein including the access control systems and hardware that potentially keeps the ASF system from being a hurricane tested assembly must be brought to the attention of the Architect. Any complications arising after bid award will be resolved and all corrective hardware will be supplied at no cost to the Owner.
 - 2. Finish on Hand-Contacted Items: Satin Chrome.
 - 3. For each door include access control (if required per 087100), exit device, narrow stile handle latch, closer, and continuous geared hinges.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 PREPARATION

- A. In addition to the finish specified, aluminum surfaces against masonry, concrete, wood, or steel shall be protected from contact by use of a coat of bituminous paint to prevent galvanic or corrosive action, or as recommended by the manufacturer and approved by the Architect.

3.03 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint backers to provide support of sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint width that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint backer.
 - b. Do not stretch, twist, puncture, or tear joint backer.
 - c. Remove absorbent joint backer that have become wet prior to sealant application and replace with dry material.
 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint backer or back of joints.
- D. Installation of Sealants: Install all sealants by proven techniques that result in sealants directly contacting and fully wetting the joint substrates, completely filling recess provided for each joint configuration, and providing uniform cross-sectional shapes and depths relative to joints widths that allow optimum sealant movement capability:
1. Fill the sealant rabbet to a slightly concave surface. Tool joints as necessary to assure continuous bonding, obtain a uniform appearance free from defects.
 2. Install sealants to depths as recommended by sealant manufacturer.
 3. Use sealing materials in strict accordance with sealant manufacturer's printed instructions.
- E. Sealant curing and Protection:
1. Cure sealants in accordance with manufacturer's recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.
 2. Ensure procedures required for cure and protection of joint sealants are followed during construction period, so that they will be without deterioration or damage.
 3. Cure and protect sealants in a manner which will minimize increases in modulus of elasticity and other accelerated aging effects. Replace or restore sealants which are damaged or deteriorating during construction period.
- F. Spaces filled with backer rod and sealant that occur between adjoining building materials and structure in excess of 3/8" will not be allowed. If the separation between the adjoining materials and the frame exceeds 3/8," then it will be the Contractor's responsibility to replace the framed unit at no cost to the Owner.
- G. Provide alignment attachments and shims to permanently fasten system to building structure.
- H. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- I. Provide thermal isolation where components penetrate or disrupt building insulation.
- J. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- K. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- L. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- M. Set thresholds in bed of sealant and secure.
- N. Install hardware using templates provided.
- O. Install glass in accordance with Section 088000, using exterior dry glazing method.
- P. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.04 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).
- C. Work shall have sharp, clean profiles, be straight and free from defects, dents, marks, waves, or flaws.
- D. Glazing rabbets shall be aligned between horizontal and vertical mullions to a tolerance of 1/32 inch total misalignment.

- E. Removable glass stops shall be centered in openings with no more than 1/32 inch gap on either side.

3.05 FIELD QUALITY CONTROL

- A. Curtain wall manufacturer to provide field surveillance of the installation or their products. Provide site surveillance at start up, 20% completion, and 60% completion of the work. Monitor installation procedures and report unacceptable conditions in writing to the Architect.

3.06 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.07 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.
- C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.08 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 085653
SECURITY WINDOWS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Detention windows, with glazing.
- B. Security transaction windows with pass-through device.

1.02 RELATED REQUIREMENTS

- A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 099113 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

- A. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- B. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
- C. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
- D. ASTM F1592 - Standard Test Methods for Detention Hollow Metal Vision Systems; 2012 (Reapproved 2019).
- E. SSPC-Paint 33 - Coal Tar Mastic Coating, Cold-Applied; 2023.
- F. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Furnish anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, to be embedded into concrete or masonry, with setting diagrams and installation, to applicable installer in time for installation.
- B. Preinstallation Meeting: Prior to start of installation arrange a meeting on site to familiarize installer and installers of related work with requirements relating to this work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's published data showing materials, construction details, dimensions of components, and finishes.
- C. Shop Drawings: Drawings prepared specifically for this project, showing plans, elevations, sections, details of construction, anchorage to other work, hardware, and glazing.
 - 1. For new work show required opening dimensions and allowance for field deviation.
- D. Test Reports: Test reports for specific window model and glazing to be furnished, showing compliance with specified requirements; window and glazing may be tested separately, provided window test sample adequately simulates the glazing to be used.
 - 1. Include testing agency qualifications.
 - 2. For structural, forced entry, and ballistic tests, provide details on method of anchorage to test frame.
- E. Samples for Selection of Applied Finishes: Color charts for factory finishes.
- F. Samples:
 - 1. Actual sections of frame members, at least 12 inch (305 mm) long, showing finish, weatherstripping, and fasteners.
- G. Coordination Drawings: For each window opening, show locations and details of items necessary to anchor windows that must be installed by others, in sufficient detail that installer of those items can do so correctly without reference to the actual window itself.

H. Manufacturer's Qualification Statement.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm with at least 10 years experience in the manufacture of windows of the type specified and able to provide test reports showing that their standard manufactured products meet the specified requirements; custom designed products not acceptable.
- B. Testing Agency Qualifications: Independent testing agency able to show experience in conducting tests of the type specified and:
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- D. Allowable tolerances: Size dimensions $\pm 1/16$ inch.
- E. Air infiltration test, meets or exceeds ASTM E283, maximum air infiltration .06 CFM/ Ft. of crack length with pressure differential across the window unit of 1.57 PSF.
- F. Water penetration test, meets or exceeds ASTM E331, no water penetration for 15 minutes when the window is subjected to a rate of flow of 5 gal. /hr./sq. ft. with differential pressure across the window unit of 2.86 PSF.
- G. Tool-resisting steel, meets or exceeds ASTM A627-03 Grade 4, submit test reports from a qualified independent testing laboratory verifying that the window manufacturer's tool-resisting steel is in conformance with ASTM A627-03.
- H. Impact Test, meets or exceeds ASTM F1592-01 "Standard Test Methods for Detention Hollow Metal Vision Systems"
 - 1. Impact Blows - Must withstand a minimum of 600 blows at each impact location (1200 total blows per frame without rail bar, 1800 total blows per frame with rail bar)
 - 2. Glazing Test – The glazing and panels shall remain in place. No damage to the extent that forcible entry can be achieved.
 - 3. Frame Test - No welded joints or the entire frame joint shall completely separate.
 - 4. The wall anchoring shall retain the frame in place throughout the test procedure to the extent that forcible entry cannot be achieved.
- I. Along with submittals, the window manufacturer shall provide the applicable test report from a qualified independent testing laboratory regularly engaged in testing windows to verify that his products conform to these test requirements. All testing must be current and meet minimum requirements in conformance with specifications.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide manufacturer's warranty agreeing to repair or replace windows and window components that fail within 5 years years after Date of Substantial Completion due to, but not limited to, the following:
 - 1. Structural failure, failure of welds, and deterioration of metals and finishes beyond that expected under detention use and normal weathering.
 - 2. Failure of glazing due to excessive deflection of supporting members under wind load.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Detention Windows:
 - 1. Hope's Windows, Inc; _____: www.hopeswindows.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 ASSEMBLIES

- A. Security and Detention Windows:
 - 1. Dimensions, profiles, features, and performance specified and indicated on drawings are required; do not deviate unless specifically approved by Engineer/Architect under substitution procedures; see Section 016000.

2. Design to fit openings indicated on drawings; design to accommodate deviation of actual construction from dimensions indicated on drawings.
 3. Fabricate frames and sash with corners mitered or coped full depth with concealed welded joints.
 4. Design anchorages to provide performance equivalent to that required for window unit; provide anchorages at least equivalent to those by which the tested units were anchored to the test frame.
 5. Separate dissimilar metals to prevent corrosion by galvanic action by painting contact surfaces with primer or with sealant or tape recommended by manufacturer for the purpose.
 6. Weld components before finishing and in concealed locations, to greatest extent possible; minimize distortion and discoloration of finish; remove residue of welding; grind exposed welds smooth and finish to match.
 7. Label units to indicate which side is which, such as inside/outside or secure/non-secure; use labels that are removable after installation but durable enough not to be lost during delivery, storage, handling, and installation.
- B. Exterior Window Requirements: Comply with following performance requirements as well as other specified criteria.
1. Structural Performance: Capable of withstanding wind loads as specified by code without permanent deformation or breakage of components, when tested in accordance with ASTM E330/E330M.
 2. Deflection of Framing Members Supporting Glass: Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edge to less than 1/175 of their lengths under specified design load.
 3. Air Leakage of Fixed Windows: 0.10 cfm/sq ft (0.5 L/sec sq m) maximum leakage for fixed window units when tested at 6.27 psf (300 Pa) pressure difference in accordance with ASTM E283/E283M.
 4. Water Penetration: None, when tested in accordance with ASTM E331 at test pressure difference of 2.86 psf (137 Pa).
 5. Provide weep holes and internal water passages to conduct infiltrated water to exterior.
 6. Provide water shed members where sash frames lap in wrong direction to shed water.
 7. Provide factory-installed weatherstripping on operable sash.

2.03 DETENTION WINDOWS

- A. Detention Windows: Factory-assembled fixed glazing frames reglazable from exterior without disassembly of ventilator frame; attach removable components with security fasteners that are not removable without the use of appropriate tools.
1. Glazing:
 - a. All Frames shall be designed for outside glazing.
 - b. Provide continuous glazing beads to suit glass as specified.
 - c. Glazing beads shall be cut and shop fitted to each glass lite prior to shipment.
 - d. Glazing beads shall be attached with tamper-resistant screws spaced a maximum of 9" on center.
 2. The perimeter framing and removable covers shall be formed from 14-gauge stainless steel.
 - a. Horizontal and/or vertical rail bars are available to receive and conceal steel detention bars without dividing the glazing area.
 - b. Thermal break shall be 1/4" x 3/4" rigid vinyl plastic.
 - c. Glazing rebate shall provide unobstructed glazing surface at least 3/4" in height.
 - d. Maximum detention windows shall have detention bars of 7/8" or 1" round and 1/4" x 2 1/2" flat tool-resisting steel conforming to ASTM specifications A627.
 - e. Glazing beads shall be formed from 14-gauge stainless steel.
 - f. Steel angles with a minimum leg thickness of 3/16".
 - g. All screws shall be tamper-resistant truss-head stainless steel.
 - h. Windows shall have #2B stainless steel finish.
 3. The perimeter framing shall consist of two units, exterior and interior sub-frames. Sub-frame member shall be coped and welded at corners the full depth of the frame for maximum strength and weather tightness, with all exposed welds dressed smooth.
 4. Optional horizontal and/or vertical imposts or rail bars shall be securely welded to the frame for maximum strength and weather tightness, with all welds dressed smooth or concealed.

5. The sub-frames and the 1/4" continuous vinyl thermal break separators shall be attached with screws spaced not more than 9" on center.
6. Anchors shall be located a maximum of 18" on center and shall be a minimum of 2" long.
7. All removable covers or trim, either exterior or interior, shall be attached with tamper-resistant screws spaced not more than 9" on center at the interior and spaced not more than 12" on center at the exterior.
8. Horizontal or vertical 7/8" or 1" round steel detention bars shall penetrate and be securely welded to the concealed 1/4" x 2 1/2" flat detention bars to form an integral detention grid. The 7/8" or 1" round detention bars shall be equipped with a feature that allows the rod to rotate freely and discourages a device from cutting into the bar.

2.04 SECURITY TRANSACTION WINDOWS

- A. Security Transaction Windows:
 1. Location: Built within interior wall, as indicated on drawings.
 2. Type of Use: Walk-up.
 3. Ballistic Resistance: Tested to meet UL 752, Level 8.
 4. Window Type: Fixed.
 - a. Mounting: Per the Drawings and Specified Frame system..
 - b. Window Size: As indicated on drawings.
 5. Glazing: Single (monolithic), clear, and ballistic resistant.
 - a. Glazing Type: G-8
 6. Communication: Standard talk-through portal.

2.05 ASSEMBLY COMPONENTS

- A. Frame Anchors: Mild steel plates, shapes, or bars, concealed in completed construction; provide anchorage devices as necessary to securely fasten windows to adjacent construction; use security fasteners for exposed anchors.
 1. Provide minimum of two anchors per side of window plus one additional anchor for each 18 inches (457 mm) or fraction thereof more than 36 inches (915 mm) in height or width.
- B. Weatherstripping: Factory installed; molded EPDM or neoprene.
- C. Glazing Seals: Factory installed; molded EPDM or neoprene compressible gaskets and compression strips.
- D. Security Fasteners: Operable only by tools produced by fastener manufacturer or manufacturer's licensee; head style appropriate to installation conditions, strength, and finish of materials being fastened; use countersunk heads wherever possible.
- E. Deal Trays: Formed stainless steel, recessed into counter or sill for mounting under glazing frame.
 1. Style: Plain curved recess with exposed flanges for flush mounting in counter or sill.
 2. Style: Non-Ricochet Currency Tray.
 3. Clear Opening Height: 1-1/2 inches (38 mm).
 4. Tray Dimensions: 16 by 11 inches (406 by 279 mm), wide by deep.
 5. Locations as indicated in the Construction Documents.
- F. Bituminous Paint: Cold-applied asbestos-free asphalt mastic, complying with SSPC-Paint 33; 30 mils, 0.030 inch (0.76 mm) minimum thickness per coat.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that window openings are ready for installation of windows.
- B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.
- C. Notify Engineer/Architect if conditions are not suitable for installation of windows; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and drawing details.

- B. Install windows in correct orientation (inside/outside or secure/non-secure).
- C. Anchor windows securely in manner so as to achieve performance specified.
- D. Separate metal members from concrete and masonry using bituminous paint.
- E. Set sill members and sill flashing in continuous bead of sealant.

3.03 CLEANING

- A. Clean exposed surfaces promptly after installation without damaging finishes.
- B. Remove and replace defective work.

END OF SECTION

SECTION 087000
DOOR HARDWARE**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- A. This Section references specification sections relating to commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding Doors.
 - 3. Other doors to the extent indicated.
- B. Commercial door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical and access control door hardware.
 - 3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
 - 4. Automatic operators.
 - 5. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Door Hardware".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions 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 the final 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. 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.
- C. 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 submitted keying schedule prior to the ordering of permanent cylinders.
- D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- 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, as applicable, permanent keys, cylinders, cores, access control credentials, software 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".

1.05 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. 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.

1.06 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.

PART 2 PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

- A. Refer to "PART 3 – EXECUTION" for required specification sections.

PART 3 EXECUTION

3.01 DOOR HARDWARE SETS

- A. The door hardware sets 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. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
 2. The supplier is responsible for handing and sizing all products.
 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.
1. Section 08 71 00 – Door Hardware.
- C. Manufacturer's Abbreviations:

			1. MK - MCKINNEY		
			2. PE - PEMKO		
			3. SU - SECURITRON		
			4. SA - SARGENT		
			5. DE - DETEX CORPORATION		
			6. RO - ROCKWOOD		
			7. RF - RIXSON		
			8. OT - OTHER		

END OF SECTION

Hardware Sets**Set: 1.0**

Doors: 1101A

Description: EXTERIOR ALUMINUM EXIT PAIR w/ STOP ARM CLOSER, CARD READER

2 Continuous Hinge	CFM_SLF-HD1 PT x Length Required		PE
2 Electric Power Transfer	EL-CEPT	630	SU
1 Removable Mullion	L980S / L980A (As Required) x Length Required	PC	SA
1 Rim Exit Device, Exit Only	55 PE8810 EO	US32D	SA
1 Rim Exit Device	56-SN200-PE8804 BIPS-0E x Less Pull	US32D	SA
2 Core/ Cylinder	as required	US32D	SA
1 Mullion Cylinder Kit	980C1	US26D	SA
1 Pull	RM202	US32D	RO
2 Surface Closer / Stop	TB 351 POTB	EN	SA
2 Door Stop	467-RKW	Black	RO
1 Gasketing	by door / frame mfg		
2 Sweep	3452AV		PE
1 Threshold	271A MSES25SS		PE
2 ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
3 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]		MK
1 Position Switch	DPS-M/W-BK		SU
1 Power Supply	AQ Series		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.

The door will remain locked in a power loss.

Free egress at all times

-Balance of hardware by storefront supplier

-Coordinate all hardware with the aluminum storefront manufacturer/supplier.

-Provide necessary drop plates and fillers for proper installation of door closers.

-Provide blocking/spacer rings in thickness as required to fill gap, if any, between cylinder head and face of door.

-Verify finish of hardware.

Set: 2.0

Doors: 1191A, 1191B

Description: EXTERIOR ALUMINUM EXIT w/ STOP ARM CLOSER, CARD READER

1 Continuous Hinge	CFM_SLF-HD1 PT x Length Required		PE
1 Electric Power Transfer	EL-CEPT	630	SU
1 Rim Exit Device	56-SN200-PE8804 BIPS-0E x Less Pull	US32D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Pull	RM202	US32D	RO

1 Surface Closer / Stop	TB 351 POTB	EN	SA
1 Door Stop	467-RKW	Black	RO
1 Gasketing	by door / frame mfg		
1 Sweep	3452AV		PE
1 Threshold	271A MSES25SS		PE
1 ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
2 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]		MK
1 Power Supply	AQ Series		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
The door will remain locked in a power loss.
Free egress at all times

- Balance of hardware by storefront supplier
- Coordinate all hardware with the aluminum storefront manufacturer/supplier.
- Provide necessary drop plates and fillers for proper installation of door closers.
- Provide blocking/spacer rings in thickness as required to fill gap, if any, between cylinder head and face of door.
- Verify finish of hardware.

Set: 3.0

Doors: 1120A, 1226A, 2218A

Description: EXTERIOR EXIT w/ STOP ARM CLOSER, CARD READER

3 Hinge, Full Mortise, Hvy Wt	T4A3386 NRP	US32D	MK
1 Electric Power Transfer	EL-CEPT	630	SU
1 Rim Exit Device	56-SN200-PE8804 BIPS-0E x Less Pull	US32D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Pull	RM202	US32D	RO
1 Surface Closer / Stop	TB 351 POTB	EN	SA
1 Door Stop	467-RKW	Black	RO
1 Gasketing	303AS (Head & Jambs)		PE
1 Rain Guard	346C x Width of Frame Head		PE
1 Sweep	3452AV		PE
1 Threshold	271A MSES25SS		PE
1 ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
2 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]		MK
1 Power Supply	AQ Series		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
The door will remain locked in a power loss.
Free egress at all times

Set: 4.0Doors: [1168A](#)

Description: EXTERIOR EXIT w/ STOP ARM CLOSER, CARD READER, DOOR VIEWER

3 Hinge, Full Mortise, Hvy Wt	T4A3386 NRP	US32D	MK
1 Electric Power Transfer	EL-CEPT	630	SU
1 Rim Exit Device	56-SN200-PE8804 BIPS-0E x Less Pull	US32D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Pull	RM202	US32D	RO
1 Surface Closer / Stop	TB 351 POTB	EN	SA
1 Door Stop	467-RKW	Black	RO
1 Gasketing	303AS (Head & Jambs)		PE
1 Rain Guard	346C x Width of Frame Head		PE
1 Sweep	3452AV		PE
1 Threshold	271A MSES25SS		PE
1 ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
2 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]		MK
1 Power Supply	AQ Series		SU
1 Door Scope	DS1000 MG		OT

Notes: Door is normally closed and secure. Access by valid credential or key override.
The door will remain locked in a power loss.
Free egress at all times

Set: 5.0Doors: [G101A](#), [G105A](#), [G106A](#), [G107A](#), [G108A](#)

Description: EXTERIOR SN200

3 Hinge, Full Mortise, Hvy Wt	T4A3386 NRP	US32D	MK
1 Electric Power Transfer	EL-CEPT	630	SU
1 Access Control Mort Lock	70 SN200-82281 BIPS-0E LNB	US26D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Door Closer	TB 281 O	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Gasketing	303AS (Head & Jambs)		PE
1 Rain Guard	346C x Width of Frame Head		PE
1 Sweep	3452AV		PE
1 Threshold	271A MSES25SS		PE
1 ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]		MK
1 Power Supply	AQ Series		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
The door will remain locked in a power loss.
Free egress at all times

Set: 6.0

Doors: 1140B, 1220A

Description: EXTERIOR SN200 w/ STOP ARM CLOSER

3 Hinge, Full Mortise, Hvy Wt	T4A3386 NRP	US32D	MK
1 Electric Power Transfer	EL-CEPT	630	SU
1 Access Control Mort Lock	70 SN200-82281 BIPS-0E LNB	US26D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer / Stop	TB 351 POTB	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Gasketing	303AS (Head & Jambs)		PE
1 Rain Guard	346C x Width of Frame Head		PE
1 Sweep	3452AV		PE
1 Threshold	271A MSES25SS		PE
1 ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]		MK
1 Power Supply	AQ Series		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
The door will remain locked in a power loss.
Free egress at all times

Set: 7.0

Doors: G102A

Description: EXTERIOR STOREROOM w/ STOP ARM CLOSER

3 Hinge, Full Mortise, Hvy Wt	T4A3386 NRP	US32D	MK
1 Storeroom Deadbolt Lock	70 8251 LNB	US26D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer / Stop	TB 351 POTB	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Door Stop	467-RKW	Black	RO
1 Gasketing	303AS (Head & Jambs)		PE
1 Rain Guard	346C x LAR		PE
1 Sweep	3452AV		PE
1 Threshold	271A MSES25SS		PE

Set: 8.0

Doors: 1140A, G103A, G104A

Description: GARAGE STOREROOM w/ CLOSER

3 Hinge, Full Mortise, Hvy Wt	T4A3386 NRP	US32D	MK
1 Storeroom/Closet Lock	70 8204 LNB	US32D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Door Closer	TB 281 O	EN	SA
1 Door Stop	467-RKW	Black	RO
1 Gasketing	303AS (Head & Jambs)		PE
1 Sweep	308APK x Door Width		PE
1 Threshold	271A MSES25SS		PE

Set: 9.0

Doors: 1101B, 1101D

Description: SN200 EXIT w/ LATCH RETRACTION, PUSH BUTTON

3 Hinge	T4A3786	US26D	MK
1 Electric Power Transfer	EL-CEPT	630	SU
1 Rim Exit Device	70 56-SN200-PE8804 BIPS-0E WEB	US32D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer	TB 351 [Reg / PA]	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Door Stop	409 / 446 [as required]	US26D	RO
1 Gasketing	S88BL		PE
1 ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
2 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]		MK
1 Pushbutton	PB Series (Located w/ Receptionist)		SU
1 Power Supply	AQ Series		SU

Notes: Door is normally closed and secure. Access by valid credential, push button or key override.
The door will remain locked in a power loss.
Free egress at all times

Set: 10.0

Doors: 1101C

Description: SN200 EXIT w/ STOP ARM CLOSER, LATCH RETRACTION, PUSH BUTTON

3 Hinge	T4A3786	US26D	MK
1 Electric Power Transfer	EL-CEPT	630	SU
1 Rim Exit Device	70 56-SN200-PE8804 BIPS-0E WEB	US32D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer / Stop	TB 351 POTB	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO

1 Door Stop	409 / 446 [as required]	US26D	RO
1 Gasketing	S88BL		PE
1 ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
2 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]		MK
1 Pushbutton	PB Series (Located w/ Receptionist)		SU
1 Power Supply	AQ Series		SU

Notes: Door is normally closed and secure. Access by valid credential, push button or key override.
The door will remain locked in a power loss.
Free egress at all times

Set: 11.0Doors: [1248A](#)

Description: SN200 EXIT

3 Hinge	T4A3786	US26D	MK
1 Electric Power Transfer	EL-CEPT	630	SU
1 Rim Exit Device	70 SN200-PE8876 BIPS-0E WEB	US32D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer	TB 351 [Reg / PA]	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Door Stop	409 / 446 [as required]	US26D	RO
1 Gasketing	S88BL		PE
1 ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]		MK
1 Power Supply	AQ Series		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
The door will remain locked in a power loss.
Free egress at all times

Set: 12.0Doors: [1121A](#), [1127A](#), [1219A](#)

Description: SN200 EXIT w/ KNUURLING

3 Hinge	TA2714	US26D	MK
1 Electric Power Transfer	EL-CEPT	630	SU
1 Rim Exit Device	70 SN200-PE8876 BIPS-0E WEB x Knurling	US32D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer	TB 351 [Reg / PA]	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Door Stop	409 / 446 [as required]	US26D	RO
1 Gasketing	S88BL		PE

1 ElectroLynx Harness	QC-C1500P [PS to Hinge]	MK
1 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]	MK
1 Power Supply	AQ Series	SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
The door will remain locked in a power loss.
Free egress at all times

Set: 13.0

Doors: 2201A, 2201B

Description: SN200 EXIT w/ STOP ARM CLOSER

3 Hinge	T4A3786	US26D	MK
1 Electric Power Transfer	EL-CEPT	630	SU
1 Rim Exit Device	70 SN200-PE8876 BIPS-0E WEB	US32D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer / Stop	TB 351 POTB	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Door Stop	409 / 446 [as required]	US26D	RO
1 Gasketing	S88BL		PE
1 ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]		MK
1 Power Supply	AQ Series		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
The door will remain locked in a power loss.
Free egress at all times

Set: 14.0

Doors: 1172A, 1172B, 1177A

Description: CLASSROOM EXIT

3 Hinge	T4A3786	US26D	MK
1 Rim Exit Device, Classroom	70 PE8813 WEB	US32D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer	TB 351 [Reg / PA]	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Door Stop	409 / 446 [as required]	US26D	RO
1 Gasketing	S88BL		PE

Set: 15.0

Doors: 1105B, 1114A, 1131A, 1143.1A, 1169A, 1170A, 1186A, 1210B, 1215A, 1247B, 2221A

Description: SN200

3 Hinge	T4A3786	US26D	MK
1 Electric Power Transfer	EL-CEPT	630	SU
1 Access Control Mort Lock	70 SN200-82271 BIPS-0E LNB	US26D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer	TB 351 [Reg / PA]	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Door Stop	409 / 446 [as required]	US26D	RO
1 Gasketing	S88BL		PE
1 ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]		MK
1 Power Supply	AQ Series		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
The door will remain locked in a power loss.
Free egress at all times

Set: 16.0

Doors: 1133A

Description: SN200 w/ PRIVACY DEADBOLT

3 Hinge	TA2714	US26D	MK
1 Electric Power Transfer	EL-CEPT	630	SU
1 Access Control Mort Lock w/ Privacy Deadbolt	70 PHR SN200-82281 BIPS-0E LNB	US26D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer	TB 351 [Reg / PA]	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Door Stop	409 / 446 [as required]	US26D	RO
1 Gasketing	S88BL		PE
1 ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]		MK
1 Power Supply	AQ Series		SU
1 Coat Hook	RM811	US26D	RO

Notes: Door is normally closed and secure. Access by valid credential or key override.
The door will remain locked in a power loss.
Free egress at all times

Set: 17.0

Doors: 1105A, 1247A

Description: SN200 w/ PUSH BUTTON

3 Hinge	TA2714	US26D	MK
1 Electric Power Transfer	EL-CEPT	630	SU

1 Access Control Mort Lock	70 SN200-82271 BIPS-0E LNB	US26D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer	TB 351 [Reg / PA]	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Door Stop	409 / 446 [as required]	US26D	RO
1 Gasketing	S88BL		PE
1 ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1 ElectroLynx Harness	QC-CXXXP [Hinge to lock/exit/reader]		MK
1 Pushbutton	PB Series (Located w/ Receptionist)		SU
1 Power Supply	AQ Series		SU

Notes: Door is normally closed and secure. Access by valid credential, push button or key override.
The door will remain locked in a power loss.
Free egress at all times

Set: 18.0

Doors: 1104B, 1125.1A, 1157A, 1171A, 1204A, 1211A, 1213A, 1225A, 2213B, 2215A, 2215B

Description: STOREROOM w/ CLOSER

3 Hinge	TA2714	US26D	MK
1 Storeroom/Closet Lock	70 8204 LNB	US32D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer	TB 351 [Reg / PA]	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Door Stop	409 / 446 [as required]	US26D	RO
3 Silencer	608		RO

Notes: *Electrical rooms with equipment rated 800 amps or more and over 6 feet wide that contain over-current devices, switching devices or control devices with exit or exit access doors shall be equipped with panic hardware or fire exit hardware. The doors shall swing in the direction of egress travel. - VERIFY

-Knurling: Where required by local code provide knurling or abrasive coating to all levers on doors leading to hazardous areas such as electrical rooms, mechanical rooms, boiler and furnace rooms, janitor closets, and as otherwise required.

Set: 19.0

Doors: 1103.1A, 1118A, 1124A, 1158A, 1161A

Description: STOREROOM w/ STOP ARM CLOSER

3 Hinge	TA2714	US26D	MK
1 Storeroom/Closet Lock	70 8204 LNB	US32D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer / Stop	TB 351 POTB	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO

1 Gasketing

S88BL

PE

Set: 20.0

Doors: 1106A, 1107A, 1108A, 1109A, 1110A, 1112A, 1113A, 1138S, 1173A, 1188A, 1190A, 1194A, 1198A, 1199A, 1200A, 1201A, 1202A, 1203A, 1208A, 1208B, 1223A, 1224A, 1226.1A, 1227A, 1228A, 1229A, 1231A, 1232A, 1233A, 1234A, 1235A, 1238A, 1239A, 1240A, 1241A, 1242A, 1243A, 1245A, 1246A, 2204A, 2210A, 2211A, 2222A, 2223A, 2224A

Description: OFFICE

3 Hinge

TA2714

US26D MK

1 Office/Entry Lock

LB 70 8205 LNB

US26D SA

1 Core/ Cylinder

as required

US32D SA

1 Door Stop

409 / 446 [as required]

US26D RO

3 Silencer

608

RO

1 Coat Hook

RM811

US26D RO

Set: 21.0

Doors: 1102A, 2207A, 2207C

Description: OFFICE w/ CLOSER

3 Hinge

TA2714

US26D MK

1 Office/Entry Lock

LB 70 8205 LNB

US26D SA

1 Core/ Cylinder

as required

US32D SA

1 Surface Closer

TB 351 [Reg / PA]

EN SA

1 Kick Plate

K1050 10" high LDW CSK BEV

US32D RO

1 Door Stop

409 / 446 [as required]

US26D RO

3 Silencer

608

RO

1 Coat Hook

RM811

US26D RO

Set: 22.0

Doors: 1104A, 1111A, 1138C, 1138D, 1174A, 1189.1A, 1189.1B, 1189A, 1189B, 1197A, 1214B, 1230A, 2202A, 2212A, 2219A, 2220A

Description: CLASSROOM

3 Hinge

TA2714

US26D MK

1 Classroom Lock

70 8237 LNB

US26D SA

1 Core/ Cylinder

as required

US32D SA

1 Door Stop

409 / 446 [as required]

US26D RO

3 Silencer

608

RO

Set: 23.0

Doors: 1101.2A, 1196A, 1209A, 1215B, 1216A, 2207B, 2213A, 2225A, 2266A

Description: CLASSROOM w/ CLOSER

3 Hinge

TA2714

US26D MK

1 Classroom Lock

70 8237 LNB

US26D SA

1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer	TB 351 [Reg / PA]	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Door Stop	409 / 446 [as required]	US26D	RO
1 Gasketing	S88BL		PE

Set: 24.0

Doors: 1138B

Description: CLASSROOM w/ CLOSER, ARMOR PLATE

3 Hinge	T4A3786	US26D	MK
1 Classroom Lock	70 8237 LNB	US26D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Surface Closer / Stop	TB 351 OTB	EN	SA
2 Armor Plate	K1050 36" high CSK BEV	US32D	RO
1 Gasketing	S88BL		PE

Set: 25.0

Description: NOT USED | PRIVACY

Set: 26.0

Doors: 1101.1A, 1123A, 1184A, 1185A, 1212A, 2216A, 2217A, 2227A, 2228A

Description: PRIVACY w/ CLOSER

3 Hinge	TA2714	US26D	MK
1 Privacy Lock	LB V11 8265 LNB	US32D	SA
1 Surface Closer	TB 351 [Reg / PA]	EN	SA
1 Mop Plate	K1050 4" high LDW CSK BEV	US32D	RO
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Door Stop	409 / 446 [as required]	US26D	RO
1 Gasketing	S88BL		PE
1 Coat Hook	RM811	US26D	RO

Set: 27.0

Doors: 1192A, 1193A, 1236A, 1236B

Description: PASSAGE

3 Hinge	TA2714	US26D	MK
1 Passage Latch	8215 LNB	US32D	SA
1 Door Stop	409 / 446 [as required]	US26D	RO
1 Gasketing	S88BL		PE

Set: 28.0

Doors: 1136A, 2203A

Description: PASSAGE w/ OHS

3 Hinge	TA2714	US26D	MK
1 Passage Latch	8215 LNB	US32D	SA
1 Surf Overhead Stop	10-X36	689	RF
3 Silencer	608		RO

Set: 29.0

Doors: 1175A, 1178A, 1179A, 1181A

Description: PASSAGE w/ STOP ARM CLOSER

3 Hinge	TA2714	US26D	MK
1 Passage Latch	8215 LNB	US32D	SA
1 Surface Closer / Stop	TB 351 POTB	EN	SA
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Gasketing	S88BL		PE

Set: 30.0

Doors: 1140.1A, 1140.2A, 1140.3A, 1140.4A

Description: FLUSH PUSH PULL w/ DEADBOLT

3 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK
1 Mortise Deadlock	70 4876 (Arch to Verify Function)	US26D	SA
1 Core/ Cylinder	as required	US32D	SA
1 Flush Pull	94BTB	US32D	RO
1 Conc Overhead Stop	2-X36	689	RF
1 Armor Plate	K1050 36" high CSK BEV	US32D	RO
3 Silencer	608		RO

Set: 31.0

Doors: 1116A, 1126A, 1128A, 1187A, 1207A, 1221A, 1222A

Description: PUSH PULL

3 Hinge	T4A3786	US26D	MK
1 Pull Plate	BF 110 x 70C	US32D	RO
1 Push Plate	70C	US32D	RO
1 Surface Closer	TB 351 [Reg / PA]	EN	SA
1 Mop Plate	K1050 4" high LDW CSK BEV	US32D	RO
1 Kick Plate	K1050 10" high LDW CSK BEV	US32D	RO
1 Door Stop	409 / 446 [as required]	US26D	RO
3 Silencer	608		RO

Set: 32.0

Doors: 1.1 FG

Description: GATE w/ CARD READER

1 Rim Exit Device	10 03Z ERxEXxW	630	DE
1 Core/ Cylinder	as required	US32D	SA
1 Card Reader	By Security Supplier		OT
1 Power Supply	AQ Series		SU
1 HBO-Balance	Balance of hardware by door mfg		

Notes: Door hardware specified is for bidding & design intent only. Verify the necessary hardware requirements with the architect, owner and security contractor before ordering/purchasing any hardware

Set: 33.0

Doors: 1128.1A, 1130A, 1134A, 1134B, 1135A, 1138A, 1138R, 1139A, 1141A, 1142A, 1143.1B, 1145A, 1146A, 1146B, 1147A, 1149A, 1150A, 1151A, 1152A, 1153A, 1153B, 1153C, 1154A, 1155A, 1159A, 1159B, 1160A, 1162A, 1163A, 1164A, 1191E

Description: DETENTION

1 HBO-Balance	Balance of hardware by door mfg

Set: 34.0

Doors: 1141B, 1141C, 1141D, 1141E, G101B, G105B, G106B, G107B, G108B

Description: OH/ AUTOMATIC SLIDER

1 Core/ Cylinder	as required	US32D	SA
1 HBO-Balance	Balance of hardware by door mfg		

END OF SECTION 080671

SECTION 087340
COMMERCIAL DOOR OPERATORS - OVERHEAD DOOR OPERATOR

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Overhead Coiling Door Openers.

1.02 RELATED SECTIONS

- A. Section 05500 - Metal Fabrications: Support framing and framed opening.
- B. Section 08330 – Overhead Coiling Doors.
- C. Section 16130 - Raceway and Boxes: Conduit from electric circuit to door operator and from door operator to control station.
- D. Section 16150 - Wiring Connections: Power to disconnect.

1.03 REFERENCES

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- C. NEMA MG 1 - Motors and Generators.

1.04 DESIGN / PERFORMANCE REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.
- B. Electric Motors shall be alternating-current squirrel-cage motors conforming with NEMA MG 1.
- C. Wiring Connections: Requirements for electrical characteristics.
 - 1. 460 volts, 60 Hz three phase.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Details of construction and fabrication.
 - 4. Installation methods.
- C. Shop Drawings: Include detailed plans, elevations, details of framing members, required clearances and accessories. Include relationship with adjacent construction.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- E. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified with minimum of five years documented experience.
- B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Install in areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship and installation is approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

- B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
- C. Store materials in a dry, warm, ventilated weathertight location.

1.08 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

- A. Provide operators with a 2 year limited warranty on motor and parts.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: sales@overheaddoor.com.
- B. Substitutions: Not permitted. Motor must be compatible with Overhead Coiling Door system.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.02 OVERHEAD ROLLING DOOR AND GRILLE OPERATORS

- A. Heavy Duty Rolling Door and Grille Operator: Model RHX True Gear Head Type Door Operator:
 - 1. Application:
 - a. Rolling Steel Doors.
 - 2. Electric Motor: UL listed.
 - a. Rating:
 - 1) 3/4 horsepower or 1 horsepower three phase with automatic thermal reset overload.
 - b. Motor frame comply with:
 - 1) NEMA 56 for 3 hp three phase.
 - c. Construction:
 - 1) Open drip-proof construction.
 - d. The operator shall be suited for:
 - 1) NEMA ICS 6 Type 4 water tight dust tight environment.
 - e. Reduction: Primary reduction is worm gear in oil bath.
 - f. Duty cycle: Accommodate heavy usage, up to 60 cycles per hour under a large constant load.
 - 1) Brake: DC Disc type with selectable Progressive Braking for smooth stopping.
 - 2) Clutch: Adjustable torque-limiter type.
 - 3) Limit System: LimitLock limit system, magnetic type providing absolute positioning with push to set and remote setting capabilities. Limit system shall remain synchronized with the door during manual operation and supply power interruptions.
 - 3. Control System: Microprocessor based with relay motor controls on a single board. System incorporates a 16 character Liquid Crystal Display (LCD) to display the system status. System shall include the following:
 - a. Capable of monitoring and reporting on a variety of operating conditions, including: Current operating status, Current command status, Motor movement status, Current error status (if applicable), Hoist Interlock status (if applicable), External Interlock status, and 24VDC status.
 - b. A delay-on-reverse operating protocol.
 - c. Maximum run timers in both directions of travel that limit motor run time in the event a clutch slips or some other problem occurs.
 - d. Provisions for the connection of a 2-wire monitored photo-eye or a 2-wire monitored edge sensor, as well as non-monitored 2-wire sensing edges, photo-eyes or other entrapment protection devices.
 - e. Control action will be constant contact close until a monitored entrapment device is installed, allowing for selection of momentary contact.
 - f. Provisions for connection of single and/or 3-button control stations.
 - g. Provisions for connection of an external 3-wire radio controls and related control devices.

- h. On board open, close and stop control keys for local operation.
 - i. CodeDodger radio receiver that is dual frequency cycling at 315 Mhz and 390 Mhz capable of storing 250 single button and/or 250 Open-Close-Stop transmitters with the ability to add and/or delete transmitters individually, identify and store activating transmitter IDs.
- 4. Mounting:
 - a. Rolling Steel doors:
 - 1) Top of hood and chain/sprocket coupling to door.
 - (a) General Contractor shall coordinate fit. If overhaed clearances do not meet top of hood mounting; provide Front of Hood coupling.
- 5. Release:
 - a. Release shall be a pull and hold type mechanism with single cable operation and an integrated interlock switch on hoist units.
- 6. Hoist: Chain hoist consists of chain pocket wheel, chain guard and smooth hand chain on hoist units.
- 7. Entrapment Protection:
 - a. Control system shall have provisions to connect monitored entrapment protection devices such as monitored electric sensing edge, or monitored photo-eye and to provide constant contact close control operation in lieu of such devices.
- 8. Control accessories:
 - a. Operator Controls:
 - 1) Controls for both interior and exterior location.
 - 2) Controls flush mounted.
 - b. Special Operation:
 - 1) Vehicle detector operation.
 - 2) Radio control operation.
 - 3) Card reader control.
 - 4) OHD monitored photo-eyes.
 - 5) Commercial photo-eyes.
 - 6) Timer Close Module for unattended timed door closing. Auxiliary control inputs, safety inputs, timer hold input and automatic door closing feature with selectable time delay. Safety inputs can be configured using on board keypad.
 - 7) Commercial light package.
 - 8) Auxiliary Output Module for up, down, and mid-stop limit status via several auxiliary sets of dry contacts that are microprocessor controlled. ADA compliant outputs that activate when door is moving up, down, or both directions and can be configured using the on board keypad.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify door sizes, configuration, tolerances and conditions are acceptable.
- B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly without distortion or stress.
- C. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

- D. Coordinate installation of electrical service with Section 16150. Complete wiring from disconnect to unit components.

3.04 ADJUSTING

- A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.
- B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. Clean components using non-abrasive materials and methods recommended by manufacturer.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.06 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 088000
GLAZING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Insulating glass units.
- B. Glazing units.
- C. Laminated glass interlayers.
- D. Glazing compounds.

1.02 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- F. ASTM C1036 - Standard Specification for Flat Glass; 2025.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.
- H. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024.
- I. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- J. ASTM C1349 - Standard Specification for Architectural Flat Glass Clad Polycarbonate; 2017 (Reapproved 2024).
- K. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.
- L. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.
- M. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2023.
- N. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.
- O. GANA (SM) - GANA Sealant Manual; 2008.
- P. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.
- Q. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.
- R. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.
- S. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.03 ACTION SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data on each Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on each Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit 1 sample 12 by 12 inch (___ by ___ mm) in size of glass units.

- E. Security Glazing Schedule: List security glazing types and thicknesses for each size opening and location. Use same designations indicated on Drawings. Indicate coordinated dimensions of security glazing and construction that receives security glazing, including clearances and glazing channel dimensions.
- F. Duplicate samples may be required. See section 016000 Product Requirements.

1.04 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of product indicated, from manufacturer.
- B. Product Test Reports: For each type of security glazing, for tests performed by a qualified testing agency.
 - 1. Provide test reports based on testing current sealant formulations within previous 36- month period.
 - a. Preconstruction adhesion and compatibility test reports.
 - b. Sample Warranties: For special warranties.
- C. Quality Assurance
 - 1. Installer Qualifications: A qualified installer who employs glazing installers for this Project who are certified under the National Glass Association Glazier Certification Program.
 - 2. Security Glazing Testing Agency Qualifications: Subject to compliance with requirements, testing agency is one of the following:
 - a. H. P. White Laboratory, Inc.
 - b. Underwriters Laboratories, Inc.
 - c. Wiss, Janney, Elstner Associates, Inc.
 - d. Sealant Testing Agency Qualifications: Qualified according to ASTM C 1021 for testing indicated.
- D. Warranty:
 - 1. Warranty Documentation: Submit manufacturer Standard warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 2. Manufacturer's Special Warranty for Glass-Clad Polycarbonate: Manufacturer agrees to replace glass-clad polycarbonate that deteriorates within specified warranty period. Deterioration of glass-clad polycarbonate is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning glass-clad polycarbonate contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced glass-clad polycarbonate standard, yellowing, and loss of light transmission.
 - a. Warranty Period: Five (5) years from date of Substantial Completion.
 - b. Manufacturer's Special Warranty on Insulating Security Glazing: Manufacturer agrees to replace insulating security glazing that deteriorates within specified warranty period. Deterioration of insulating security glazing is defined as defects in individual lites developed from normal use or failure of hermetic seal under normal use including:
 - 1) Defects in coated-glass lites include peeling, cracking, and other indications of deterioration in coating.
 - 2) Defects in laminated-glass lites include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 3) Defects in glass-clad polycarbonate lites include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced glass-clad polycarbonate standard, yellowing, and loss of light transmission.
 - 4) Evidence of hermetic seal failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glazing.
 - 5) Deterioration does not include defects in individual lites or failure of hermetic seal that is attributed to glass breakage or to maintaining and cleaning insulating security glazing contrary to manufacturer's written instructions.

1.05 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective

manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.
- C. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- D. Source Limitations for Glass: Obtain tinted float glass laminated glass insulating glass from single source from single manufacturer for each glass type.
- E. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

1.07 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on security glazing, minimum edge and face clearances, and adequate sealant thicknesses. with reasonable tolerance.

1.08 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.
- C. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.
- C. Laminated Glass: Provide a ten (10) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Laminated Glass Manufacturers:
 - 1. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.

- C. Polycarbonate Security Glazing:
 - 1. Global Security Glazing, Selma, Alabama.
 - 2. Substitutions: See Section 016000-Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Design Pressure: Calculated in accordance with ASCE 7.
 - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 4. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
 - 1. In conjunction with weather barrier related materials described in other sections, as follows:
 - a. 071300 - Sheet Waterproofing
 - 2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.
 - 3. To maintain a continuous vapor retarder and/or air barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.
- D. SECURITY GLAZING, GENERAL
 - 1. Glazing Publications: Comply with published recommendations of security glazing and glazing material 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.
 - a. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 - b. Plastic Glazing Labeling: Identify plastic sheets with appropriate markings of applicable testing and inspecting agency, indicating compliance with required fire-test-response characteristics.
 - c. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the Safety Glazing Certification Council. Label shall indicate manufacturer's name, type of glazing, glass thickness, and safety glazing standard with which glazing complies.
 - 2. Ballistics Resistance: Provide glazing materials capable of resisting ballistic impact at levels indicated as determined from testing identical materials according to UL 752.
 - a. Attack Resistance: Provide glazing materials capable of resisting attack of type and at security-grade levels indicated as determined from testing identical materials according to ASTM F 1915.
 - b. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glazing framing members and glazing components.
 - 1) Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
 - c. Insulating Glazing 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.

- d. Fire-Test-Response Characteristics of Polycarbonate Sheets: As determined by testing polycarbonate sheets identical to those used in security glazing products by a qualified testing agency acceptable to authorities having jurisdiction.
 - 1) Self-ignition temperature of 650 deg F or more when tested according to ASTM D 1929 on plastic sheets in thicknesses indicated for the Work.
 - 2) Smoke-Developed Index of 450 or less when tested according to ASTM E 84, or smoke density of 75 or less when tested according to ASTM D 2843 on plastic sheets in thicknesses indicated for the Work.
 - 3) Burning extent of 1 inch or less when tested according to ASTM D 635 at a nominal thickness of 0.060 inch or thickness indicated for the Work.
- e. Thermal and Optical Performance Properties: Provide security glazing with performance properties specified, as indicated in manufacturer's published test data, based on construction products indicated and on procedures indicated below:
 - 1) U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 - 2) Solar-Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - 3) Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.03 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 - 2. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class A, or 16 CFR 1201 - Category II criteria.
 - 3. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.
 - 4. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 - 1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class A or 16 CFR 1201 - Category II impact test requirements.
 - 2. Polyvinyl Butyral (PVB) Interlayer: 0.090 inch (2.286 mm) thick, minimum.
- C. Polycarbonate Security Glazing
 - 1. Polycarbonate Sheet: ASTM C 1349, Appendix X1, Type II, coated, mar-resistant, UV-stabilized polycarbonate with coating on exposed surfaces and Type I, standard, UV-stabilized polycarbonate where no surfaces are exposed.
 - 2. Laminated Polycarbonate: Polycarbonate sheets laminated with clear urethane interlayer that complies with ASTM C 1349, Appendix X2, and has a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation. Provide laminated units that comply with requirements of ASTM C 1349 for maximum allowable laminating process blemishes and haze.
 - 3. Glass-Clad Polycarbonate: ASTM C 1349.

2.04 INSULATING GLASS UNITS

- A. Manufacturers:
 - 1. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Insulating Glass Units: Types as indicated.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 - 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 - 3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
 - 4. Spacer Color: Black.

5. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and polysulfide sealant as secondary seal applied around perimeter.
6. Color: Black.
7. Purge interpane space with dry air, hermetically sealed.
- C. Type IG-1 - Hurricane Impact Resistance Insulating Glass Units: Vision glass, double glazed.
 1. Applications: Exterior glazing unless otherwise indicated.
 2. Space between lites filled with argon.
 3. Outboard Lite: Fully tempered float glass, 1/2 inch (____ mm) thick, minimum.
 - a. Tint: Gray.
 - b. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
 - c. Coating: Low-E (passive type), on #2 surface.
 4. Metal edge spacer.
 5. Inboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
 - a. Tint: Clear.
 6. Total Thickness: 1-1/4" inch (____ mm).
 7. Thermal Transmittance (U-Value), Summer - Center of Glass: .20, nominal.
 8. Visible Light Transmittance (VLT): 46 percent, nominal.
 9. Shading Coefficient: .26, nominal.
 10. Solar Heat Gain Coefficient (SHGC): .23, nominal.
 11. Visible Light Reflectance, Outside: 8 percent, nominal.
 12. Glazing Method: Dry glazing method, gasket glazing.

2.05 GLAZING UNITS

- A. Type G-2 - Monolithic Interior Vision Glazing:
 1. Applications: Interior glazing unless otherwise indicated.
 2. Glass Type: Fully tempered float glass.
 3. Tint: Clear.
 4. Thickness: 1/4 inch (6.4 mm), nominal.
- B. Type G-5 - Detention Glazing: Laminated glass, 3-ply.
 1. Applications: Detention Door Lites unless otherwise indicated.
 2. Tint: Clear.
 3. Thickness: 1 inch (25.4 mm).
 4. Outside Lite: Tempered glass.
 5. Interlayer, Outboard Side: Polyvinyl butyral (PVB); thickness as required to meet performance criteria.
 6. Middle Lite: Tempered glass.
 7. Interlayer, Inboard Side: Polyvinyl butyral (PVB); thickness as required to meet performance criteria.
 8. Inside Lite: Tempered glass.
 9. Performance Criteria:
 10. Glazing Method: As required to meet performance criteria.
- C. Type G-6 - Hurricane Impact Resistance Glazing: Laminated glass, 2-Ply.
 1. Applications: Exterior door lites or as indicated on drawings.
 2. Tint: Gray.
 3. Thickness: 9/16 inch (____ mm).
 4. Outside Lite: Tempered glass.
 5. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
 6. Inside Lite: Tempered glass.
 7. Performance Criteria:
 - a. Hurricane Impact Resistance: Comply with ASTM E1996 windborne debris requirements for "Enhanced Protection" within Wind Zone 1.
 8. Visible Light Transmittance (VLT): 41 percent, nominal.

9. Shading Coefficient: .44, nominal.
 10. Solar Heat Gain Coefficient (SHGC): .38, nominal.
 11. Visible Light Reflectance, Outside: 9 percent, nominal.
 12. Glazing Method: Dry glazing method, tape and tape.
- D. Type G-7 - Glass-Clad Polycarbonate Security Glazing: Laminated glass and polycarbonate, 2-Ply; ASTM C1349.
1. Applications: Exterior windows at jail and/or detention locations unless noted otherwise.
 2. Tint: Clear.
 3. Thickness: As required to meet performance criteria.
 4. Outer Lite: Tempered glass.
 5. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
 6. Inside Lite: Polycarbonate.
 7. Performance Criteria:
 8. Bullet Resistance: Pass UL 752 tests in compliance with ballistic criteria level and weapon description indicated; Level 2 - .357 magnum jacketed lead soft point.
- E. Type G-8 - Glass-Clad Polycarbonate Security Glazing: Laminated glass and polycarbonate, 2-Ply; ASTM C1349.
1. Applications: At openings receiving level 8 ballistic security glazing.
 2. Tint: Clear.
 3. Thickness: As required to meet performance criteria.
 4. Outer Lite: Tempered glass.
 5. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
 6. Inside Lite: Polycarbonate.
 7. Performance Criteria:
 - a. Bullet Resistance: Pass UL 752 tests in compliance with ballistic criteria level and weapon description indicated; Level 8 - 7.62 mm rifle lead core full metal copper jacket, military ball.
 8. Manufacturers:
 - a. Global Security Glazing; Secure-Tem 5 + Poly SP028 with PE399 White Urethane.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.06 LAMINATED GLASS INTERLAYERS

- A. Hurricane-Resistant Polyvinyl Butyral (PVB) Interlayer for Laminated Glazing:
1. Functionality: Post-breakage hurricane resistance.
 2. Applications:
 3. Color: Clear.
 4. Thickness: 0.090 inch, 90 mil, nominal (2.28 mm, nominal).

2.07 GLAZING COMPOUNDS

- A. Type GC-2 - Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.
- B. Type GC-3 - Polysulfide Sealant: Two component; chemical curing, nonsagging type; ASTM C920 Type M, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.08 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.
- B. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
- C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION**3.01 VERIFICATION OF CONDITIONS**

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- C. Verify that sealing between joints of glass framing members has been completed effectively.
- D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 INSTALLATION - DRY GLAZING METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.
- B. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- E. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- F. Carefully trim protruding tape with knife.

3.06 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

- A. Application - Interior Glazed: Set glazing infills from the interior of the building.
- B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- E. Place glazing tape on free perimeter of glazing in same manner described above.
- F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- G. Carefully trim protruding tape with knife.

3.07 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.

- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.08 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 090561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 - 1. Resilient tile and sheet.
 - 2. Thin-set ceramic tile and stone tile.
- B. Removal of existing floor coverings.
- C. Preparation of new and existing concrete floor slabs for installation of floor coverings that fail the moisture tests required in specified flooring sections.
- D. Testing of concrete floor slabs for moisture and alkalinity (pH).
- E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
 - 1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.
- F. Patching compound.
- G. Remedial floor coatings.
- H. Remedial floor treatment.
- I. Remedial floor sheet membrane.

1.02 RELATED REQUIREMENTS**1.03 REFERENCE STANDARDS**

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2024.
- B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.
- C. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2024.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- F. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.04 SUBMITTALS

- A. Visual Observation Report: For existing floor coverings to be removed.
- B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
 - 1. Moisture and alkalinity (pH) limits and test methods.
 - 2. Manufacturer's required bond/compatibility test procedure.
- C. Testing Agency's Report:
 - 1. Description of areas tested; include floor plans and photographs if helpful.
 - 2. Summary of conditions encountered.
 - 3. Moisture and alkalinity (pH) test reports.
 - 4. Copies of specified test methods.
 - 5. Recommendations for remediation of unsatisfactory surfaces.
 - 6. Product data for recommended remedial coating.

7. Submit report to Engineer/Architect.
 8. Submit report not more than two business days after conclusion of testing.
- D. Adhesive Bond and Compatibility Test Report.
- E. Copy of RFCI (RWP).

1.05 QUALITY ASSURANCE

- A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.
- B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
- C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
 2. Confirm date of start of testing at least 10 days prior to actual start.
 3. Allow at least 4 business days on site for testing agency activities.
 4. Achieve and maintain specified ambient conditions.
 5. Notify Engineer/Architect when specified ambient conditions have been achieved and when testing will start.

1.06 FIELD CONDITIONS

- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).
- B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
 2. Gypsum content is prohibited.
 3. Provide rapid fast cure floor patch.
 4. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
 5. Products:
 - a. Use product compatible/recommended by manufacturer of flooring specified.
- B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.
- C. Provide rapid fast cure adhesives.
- D. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
 2. Use product recommended by testing agency and is compatible/recommended by manufacturer of flooring specified.

- E. Remedial Floor Treatment: Penetrating, spray-applied, silicate-based product intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
 - 1. Use product recommended by testing agency and is compatible/recommended by manufacturer of flooring specified.
- F. Remedial Floor Sheet Membrane: Pre-formed multi-ply sheet membrane installed over concrete subfloor and intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
 - 1. Thickness: 28 mil (0.028 inch) (0.711 mm).
 - 2. Tape: Types recommended by underlayment manufacturer to install membrane and cover seams.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

- A. Perform following operations in the order indicated:
 - 1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
 - a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
 - b. Removal of existing floor covering and adhesives.
 - c. Concrete must be cleaned and etched to a concrete surface profile (CSP) of 2-3 to open the pores and remove impurities.
 - 2. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
 - a. Remove existing coatings and curing agents from surface according to recommendations of remedial coating manufacturer.
 - b. Prepare surface according to recommendations of remedial coating manufacturer and according to ASTM D4259.
 - 3. Preliminary cleaning.
 - 4. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.
 - 5. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 - 6. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 - 7. Specified remediation, if required.
 - 8. Patching, smoothing, and leveling, as required.
 - 9. Other preparation specified.
 - 10. Adhesive bond and compatibility test.
 - 11. Protection.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

- A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.
- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 MOISTURE VAPOR EMISSION TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.
- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.
- F. Report: Report the information required by the test method.

3.04 ALKALINITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.05 ADHESIVE BOND AND COMPATIBILITY TESTING

- A. Comply with requirements and recommendations of floor covering manufacturer.

3.06 APPLICATION OF REMEDIAL FLOOR COATING

- A. Comply with requirements and recommendations of coating manufacturer.

3.07 APPLICATION OF REMEDIAL FLOOR TREATMENT

- A. Comply with requirements and recommendations of treatment manufacturer.

3.08 INSTALLATION OF REMEDIAL FLOOR SHEET MEMBRANE

- A. Install in accordance with sheet membrane manufacturer's instructions.

END OF SECTION

SECTION 092116
GYPSUM BOARD ASSEMBLIES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Interior wall and ceiling sound attenuation insulation.
- D. Tile backing board.
- E. Gypsum wallboard.
- F. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 079200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

- A. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- B. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.
- C. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2023.
- D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- E. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020 (Reapproved 2024).
- F. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
- G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2024.
- I. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.
- J. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.
- K. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- L. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022, with Editorial Revision (2023).
- M. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.
- N. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- O. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- P. ASTM E413 - Classification for Rating Sound Insulation; 2022.

Q. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

R. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data:
- C. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum five years of experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
 - 1. See PART 3 for finishing requirements.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC of 50-54 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:
 - 1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
- B. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. Clarkwestern Dietrich Building Systems LLC; <>: www.clarkdietrich.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- C. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/360 at 5 psf (L/360 at 240 Pa).
 - 1. Studs: "C" shaped with flat or formed webs. Size as called for on the drawings unless deflection requirements above require deeper members.
 - 2. Furring: 1-1/2" hat-chaped sections unless called for otherwise.
 - 3. Metal Stud Clip Angles: Size as required for proper installation and support of adjacent studwork.
 - 4. Resilient Furring Channels: Single leg configuration; 1/2 inch (13 mm) channel depth.
 - a. Products:
 - 1) ClarkDietrich; RC Deluxe Resilient Channel: www.clarkdietrich.com/#sle.
 - 2) Substitutions: See Section 016000 - Product Requirements.
- D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.
 - 1. For walls with top tracks that do not connect directly to building structure: Diagonally Brace Stud wall partitions to structure above as required to maintain deflection requirements hererin.
- E. Non-structural Framing Accessories:
 - 1. Extruded Aluminum Partition Gap Closure.
 - a. Color: black to match Aluminum Store Front framing
 - b. Products:
 - 1) Gordon Inc.; Mullion Mate Plus - 5 (against the Mullion/ Against the Glass) : www.truformprofiles.com
 - 2) Substitutions: See Section 016000-Product Requirements
 - 2. Mullion Mate End Caps

- a. Color: Black to match Aluminum Store Front Framing.
- b. Products:
 - 1) Gordon Inc.; MMEC - ### : www.truformprofiles.com.
(a) Provide in thickness as required by partition types and locations.
 - 2) Substitutions: See Section 016000-Product Requirements

2.03 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 1. Georgia-Pacific Gypsum; <>: www.gpgypsum.com/#sle.
 2. National Gypsum Company; (Gold Bond Building Products, LLC provided by National Gypsum Company) : www.nationalgypsum.com/#sle.
 3. USG Corporation; <>: www.usg.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned. However, the building at the very least must be temporarily closed in and such enclosure must be reviewed and approved by the architect prior to any drywall installation can occur.
 - b. Mold resistant board is required in all restrooms, janitors closets, kitchens, shower rooms, and any other wet type locations of similar nature..
 3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 4. At Ceilings where Gypsum Board occurs: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place.
 5. Thickness:
 - a. Vertical Surfaces: 5/8 inch (16 mm).
 - b. Ceilings: 5/8 inch (16 mm).
 6. Paper-Faced Products:
 - a. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gpgypsum.com/#sle.
 7. Mold-Resistant, Paper-Faced Products:
 - a. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.gpgypsum.com/#sle.
- C. Backing Board For Wet Areas: One of the following products:
 1. Application: Surfaces behind tile in wet areas including tub and shower surrounds.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Products:
 - 1) Schluter Kerdi-board; www.schluter.com.
 - 2) Substitutions: See Section 016000 - Product Requirements.
- D. Backing Board For Tile: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
 1. Application: _____
 - a. Vertical surfaces behind thinset tile, except in wet areas
 - b. Vertical surfaces behind shower/tub seamless surround inserts in wet areas
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Type: Regular and Type X, in locations indicated.
 4. Type X Thickness: 5/8 inch (16 mm).
 5. Regular Board Thickness: 1/2 inch (13 mm).
 6. Edges: Tapered.
 7. Products:

- a. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.
- b. Substitutions: See Section 016000 - Product Requirements.

2.04 GYPSUM BOARD ACCESSORIES

- A. Interior Sound Attenuation Insulation
 1. Product: Owens Corning PINK Next Gen Sound Attenuation Batts (SAB) or equal.
 2. Faced: No
 3. Thickness: 3.5 inches
 4. Width: As required for stud spacing
- B. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
 1. Corner Beads: Low profile, for 90 degree outside corners.
 - a. Products:
 - 1) Phillips Manufacturing Co; Everlast Corner Bead: www.phillipsmfg.com/#sle.
 - 2) Substitutions: See Section 016000 - Product Requirements.
- C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 1. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners.
 - a. Application: Areas not requiring moisture resistant drywall.
 2. Joint Compound: Drying type, vinyl-based, ready-mixed.
- D. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- E. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C1007/AISI S220 and manufacturer's instructions.
- B. Studs: Space studs at 16 inches on center (at 406 mm on center).
 1. Extend partition framing to structure where indicated and to ceiling in other locations.
 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
- C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- D. Standard Wall Furring: Install at masonry walls scheduled to receive gypsum board, not more than 4 inches (100 mm) from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 16 inches (____ mm) on center.
 1. Orientation: Horizontal.
 2. Spacing: At 16 inches on center (At 400 mm on center).
- E. Blocking: Install wood blocking for support of:
 1. Framed openings.
 2. Wall-mounted cabinets.
 3. Plumbing fixtures.
 4. Toilet partitions.
 5. Toilet accessories.
 6. Wall-mounted door hardware.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

3.04 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 - 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- C. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- D. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- E. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

- A. Corner Beads: Install at external corners, using longest practical lengths.
- B. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 2. Level 3: Walls to receive textured wall finish.
 - 3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 4. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
- D. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

SECTION 093000
TILING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Ceramic accessories.
- D. Trim and accessories for a complete installation.

1.02 RELATED REQUIREMENTS

- A. Section 079200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- B. Section 092116 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

- A. ANSI A108.1b - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.
- B. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.
- C. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2023.
- D. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar; 2023.
- E. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 2023.
- F. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).
- G. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.
- H. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.
- I. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.
- J. ANSI A118.5 - American National Standard Specifications for Chemical Resistant Furan Mortars and Grouts for Tile Installation; 1999 (Reaffirmed 2021).
- K. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2023.
- L. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2024).
- M. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
- N. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).
- O. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2025.
- P. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation; 2023.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Samples: provide two samples in actual size of each tile specified.
- E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 5 percent of each size, color, and surface finish combination, but not less than one box of each type.

1.05 MOCK-UPS

- A. See Section 014000 - Quality Requirements for general requirements for mock-up.
- B. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.
 - 1. Approved mock-up may remain as part of work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.
 - 1. Deliver packaged materials and store in original containers with seals unbroken and labels intact until time of use, in accordance with manufacturer's instructions. All cartons must be from the same Lot.

1.07 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature above 50 degrees F (10 degrees C) and below 100 degrees F (38 degrees C) during installation and curing of setting materials.

PART 2 PRODUCTS**2.01 TILE**

- A. Manufacturers: All products by the same manufacturer.
 - 1. Milestone; www.milestonetiles.com/
- B. Colors, patterns, and locations of all tile types are as indicated on the Drawings. Manufacturer's listed on the Drawings and below are to be Architect's control samples. Other manufacturer's must submit samples prior to bid matching color and finish in order to be considered "equal".
- C. Porcelain Tile, Type FT-1 and WT-1: ANSI A137.1, standard grade.
 - 1. Provide as floor tile in locations scheduled on Drawings and provide as wall tile in locations scheduled on Drawings and provide as wall base in locations scheduled on Drawings.
 - 2. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 - 3. Sizes:
 - a. Floor Tile: FT-1/FT-2: 12"x24"
 - b. Floor Tile: FT-3: 32"x32"
 - c. Cove Base: TB-1/TB-2: 6"x12"
 - d. Wall Tile: WT-1 12x24
 - 4. Thickness: 3/8 inch (9.5 mm).
 - 5. Edges: Square.
 - 6. Surface Finish: Unglazed.

2.02 TRIM AND ACCESSORIES

- A. Trim/Termination Strips: Satin natural anodized extruded aluminum, style and dimensions to suit application, indicated below, or if not indicated to suit application, for setting using tile mortar or adhesive.
1. Floor transitions must be ADA compliant.
 2. Applications:
 - a. Open cut or unfinished edges (end or top) of wall tile equal to Schluter QUADEC.
 - b. Tile to Tile Outside corners equal to Schluter QUADEC.
 - c. Tile to carpet transitions equal to Schluter SCHIENE.
 - d. Tile to VCT transitions equal to Schluter RENO-U.
 - e. Wall corners, outside and inside where tile abuts another material besides tile equal to Schluter QUADEC.
 - f. Tile to concrete transitions equal to Schluter Reno-Ramp/-K.
 - g. Tile to tile at 90 deg. angle transition equal to Schluter DILEX Cove.
 - h. In other locations as indicated on Drawings.
 - i. Provide in heights to suit application.
 3. Products:
 - a. Schluter-Systems: www.schluter.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.03 SETTING MATERIALS

- A. Manufacturers:
1. LATICRETE International, Inc: www.laticrete.com.
 2. Mapei Corporation; ____: www.mapei.com/#sle.
 3. Merkrete, by Parex USA, Inc: www.merkrete.com.
 4. Schluter-Systems; ____: www.schluter.com/#sle.
 5. ProSpec, an Oldcastle brand: www.prospec.com.
 6. Substitutions: See Section 016000 - Product Requirements.

2.04 GROUTS

- A. Manufacturers:
1. LATICRETE International, Inc: www.laticrete.com/#sle.
 2. Substitutions: See Section 016000 - Product Requirements.
- B. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
1. Applications: At all floor and wall tile locations except kitchen.
 2. Color(s): As selected by Engineer/Architect from manufacturer's full line.
 3. Products:
 - a. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.05 ACCESSORY MATERIALS

- A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
1. Crack Resistance: No failure at 1/8 inch (3.2 mm) gap, minimum.
 2. Bonded Sheet Membrane Type:
 - a. Material: Polyethylene sheet membrane with polyester fleece laminated to underside, 20 mils (0.5 mm) thick.
 - b. Products:
 - 1) Schluter-Systems; DITRA: www.schluter.com/#sle.
- B. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Bonded Sheet Membrane Type: Wall application
 - a. Material: Polyethylene vinyl acetate (PEVA) core with nonwoven polypropylene laminated to both sides, 8 mils (0.2 mm) thick.

- b. Products:
 - 1) Schluter-Systems; KERDI: www.schluter.com/#sle.
- C. Waterproofing Tape: for reinforcing and sealing joints in sheet waterproofing membranes.
 - 1. Manufacture:
 - a. Schluter www.schluter.com.
- D. Membrane at Walls: joints, seams, corners, and sealing joint at floor to wall connection at waterproofing/uncoupling membrane
 - 1. Material: 4 mil (0.1 mm) polyethylene film fleece laminated on both sides
 - 2. Products:
 - a. Schluter Band. www.schluter.com

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- B. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.03 INSTALLATION - GENERAL

- A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) or TCNA (HB-GP) recommendations, as applicable.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.
- D. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- F. Form internal angles square and external angles square.
- G. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built up items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations, so that plates, collars or covers overlap tile.
- H. Install tile base without wall tile using dry set or latex portland cement.
- I. Jointing Pattern: Unless indicated otherwise, lay tile in grid pattern. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting and slithers of tile. Provide uniform joint widths.
- J. Install expansion joints where tile work abuts restraining surfaces such as perimeter walls, columns, etc. Install directly over joints in structural floor including construction joints or cold joints. Set compressible back up strip when mortar is placed or utilize removable wood strips to provide space for back up after mortar has cured. Install sealant after tile work and grout are dry. Follow sealant manufacturer's recommendations.

- K. Install non-ceramic trim in accordance with manufacturer's instructions.
- L. Sound tile after setting. Replace hollow sounding units.
- M. Keep control and expansion joints free of mortar, grout, and adhesive.
- N. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- O. Grout tile joints unless otherwise indicated.
- P. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
 - 1. Where epoxy bond coat and grout are indicated, install in accordance with TCNA (HB) Method F131.
 - 2. Where furan bond coat and grout are indicated, install in accordance with TCNA (HB) Method F133.
- B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.05 CLEANING

- A. Clean tile and grout surfaces per manufacturers requirements for each specific product.
- B. Clean all tile surfaces so they are free of foreign matter.
- C. Leave tile work clean and free of non-uniform joints, cracked, chipped, broken, unbonded, or otherwise defective tile work.

3.06 PROTECTION

- A. Do not permit traffic over finished floor surface for seven days after installation.
- B. Protect wall tile surfaces to prevent damage for duration of construction.

END OF SECTION

SECTION 095100
ACOUSTICAL CEILINGS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Acoustical ceiling panels.
- B. Exposed grid suspension system.
- C. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
- D. Perimeter Trim.

1.02 RELATED REQUIREMENTS

- A. Section 092116 - Gypsum Board Assemblies

1.03 REFERENCE STANDARDS

- A. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
- C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019 (Reapproved 2025).
- D. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
- E. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
- F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.
- G. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning. Coordinating installation and spacing with hanger attachment to building structure and ceiling mounted items.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Samples: Submit two samples 6 by 6 inch (____by____ mm) in size illustrating material and finish of acoustical units.
- E. Samples: Submit two samples each, 8 inches (____ mm) long, of suspension system main runner.
- F. Duplicate samples may be required. See section 016000 Product Requirements.
- G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- H. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Acoustical Units: Quantity equal to 5 percent of total installed or minimum one full box per tile type.

1.06 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer: Firm with not less than Five years documented experience in installation of ceiling systems similar to those specified and is acceptable to Manufacturer of specified products.
- D. Provide acoustical panel units and grid components by a single manufacturer.
- E. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.08 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.
- B. Do not install acoustical units until after interior wet work is dry.
- C. Do not install until space is fully enclosed and fully conditioned.
- D. Do not install until work above ceiling is complete.

1.09 WARRANTY

- A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
 - 1. Acoustical Panels: Sagging and warping
 - 2. Grid System: Rusting and manufacturer's defects
- B. Warranty Period:
 - 1. Acoustical panels: Ten (10) years from date of substantial completion.
 - 2. Grid: Ten (10) years from date of substantial completion.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc; ____: www.armstrongceilings.com/#sle.
 - 2. CertainTeed Architectural; ____: www.certainteed.com/ceilings-and-walls/#sle.
 - 3. USG Corporation; ____: www.usg.com/ceilings/#sle.
- B. Suspension Systems:
 - 1. Armstrong World Industries, Inc; ____: www.armstrongceilings.com/#sle.
 - 2. CertainTeed Architectural; ____: www.certainteed.com/ceilings-and-walls/#sle.
 - 3. USG Corporation; ____: www.usg.com/ceilings/#sle.
- C. Perimeter Systems:
 - 1. Armstrong World Industries, Inc: www.armstrong.com.
 - 2. CertainTeed Corporation: www.certainteed.com.
 - 3. USG: www.usg.com.
 - 4. Substitutions: See Section 016000 - Product Requirements.

2.02 PRODUCTS

- A. Basis of Design: Products are Manufacturer Armstrong Ceilings or approved equal.

- B. General: Eliminate tee near wall by providing a cut 24X48 inch panel extending to wall where units at wall are less than six (6) inches wide.
- C. Acoustical Panels Type ACT-1: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
 - 1. Size: 24 by 24 inches (600 by 600 mm).
 - 2. Thickness: 15/16 inches (____ mm).
 - 3. Composition: Wet felted.
 - 4. Light Reflectance: .83 percent, determined in accordance with ASTM E1264.
 - 5. NRC Range: .5 to .5, determined in accordance with ASTM E1264.
 - 6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
 - 7. Edge: Angled Tegular.
 - 8. Surface Color: White.
 - 9. Surface Pattern: Perforated, small holes.
 - 10. Suspension System: Exposed grid.
 - 11. Products:
 - a. Armstrong World Industries Dune.
 - b. Substitutions: See Section 016000 - Product Requirements.
- D. ACT-1: Standard Acoustical Ceiling Tile
 - 1. Standard Acoustical Ceiling Tile- ACT1
 - a. 1774 Dune as manufactured by Armstrong Ceilings
 - 1) Surface Texture: Fine
 - 2) Composition: Mineral Fiber
 - 3) Color: White
 - 4) Size:
 - (a) ACT1- 24IN x 24IN
 - 5) Edge Profile: Angled Tegular 15/16IN for interface with Prelude XL 15/16" Exposed Tee grid.
 - 6) Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton 0.50.
 - 7) Ceiling Attenuation Class (CAC) : ASTM C 1414; Classified with UL label on product carton 35.
 - 8) Flame Spread: ASTM E 1264; Class A (UL)
 - 9) Light Reflectance White Panel: ASTM E 1477; 0.81
 - 10) Dimensional Stability: HumiGuard Plus
 - 11) Recycle Content: 50% total recycled content
- E. Acoustical Ceiling Tile: ACT4
 - 1. Style: Techzone
 - 2. Panels: 2825 Calla (field panels)
 - 3. Size: 24"x48"
 - 4. Edge: Tegular
 - 5. Color: White
- F. Acoustical Ceiling Metal Floating Cloud: MC1
 - 1. Serpentina Waves- Curved Metal Clouds as Manufactured by Armstrong Ceilings
 - a. Style: Hill/Valley
 - b. Surface Texture: Smooth
 - c. Composition: Metal
 - d. Color: White
 - e. Size: As indicated on Drawings
 - f. Edge Profile: Vector 15/16IN for interface with Prelude XL 15/16" Exposed Tee grid.
 - g. Perforation Option: Micro
 - h. Infill: Acoustical Fleece
 - 1) Color: White

- i. Mounting Installation: Acoustical Cloud Individual Hanging Kit

2.03 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems Interior:
 - 1. Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
 - a. Structural Classification: ASTM C 635 Intermediate Duty
 - b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
 - c. Product: Prelude XL 15/16" Exposed Tee as manufactured by Armstrong Ceilings.
 - 2. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
 - 3. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.
 - 4. Edge Moldings and Trim:
 - a. 7800 - 12ft Wall Molding
 - 5. Floating Acoustical Ceiling Clouds: provide 4 inch vertical Axiom trim in the color white; model number AX4STRWH".

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch (2 mm) galvanized steel wire.
- C. Perimeter Moldings: Same metal and finish as grid.
- D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.
- C. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.02 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
- B. Allow acoustical ceiling units to reach room temperature and stabilized moisture content before installation of units.

3.03 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM C636/C636M, and ASTM C636/C636M and as supplemented in this section.
- B. Install system per manufacturer's installation instructions.
- C. Suspend main beam from overhead construction with hanger wires spaced 4'-0" on center along the length of the main runner. Install hanger wires plumb and straight.
- D. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- E. Locate system on room axis according to reflected plan.

- F. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
- G. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- H. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- I. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- J. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.
- K. Do not eccentrically load system or induce rotation of runners.
- L. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Miter corners accurately and connect securely or install corner caps.
 - 2. Attach molding to substrate at intervals of 16 inches o.c. and not more than 3 inches from ends.
 - 3. Maintain tolerance of 1/8 inch in 12 feet of ceiling suspension system.

3.04 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.
- C. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- D. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- E. Fit border trim neatly against abutting surfaces.
- F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- G. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.
- H. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
- I. Install hold-down clips on panels within 20 ft (6 m) of an exterior door.

3.05 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

- A. Clean exposed surfaces of acoustical ceilings per manufacturer's instructions.
- B. Clean trim, edge moldings and suspension members per manufacturer's instructions.
- C. Remove and replace all work that can not be cleaned to eliminate evidence of soil or residue, that is broken or damaged.

- D. Before disposing of ceilings, contact the Armstrong Recycling Center at 877-276-7876, select option #1 then #8 to review with a consultant the condition and location of building where the ceilings will be removed. The consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant will provide assistance to facilitate the recycle of the ceiling.

END OF SECTION

**SECTION 096500
RESILIENT FLOORING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.
- D. Concrete Testing prior to Flooring Installation.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

1.03 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025.
- B. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
- C. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
- D. ASTM F137 - Standard Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus
- E. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- F. ASTM F925 - Standard Test Method for Resistance to Chemicals of Resilient Flooring
- G. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2022.
- H. ASTM F1514 - Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color Change.
- I. ASTM F1515 - Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change
- J. ASTM F1700 - Standard Specification for Solid Vinyl Floor in Modular Format such as Tile(s) or Plank(s); 2025.
- K. ASTM F1914 - Standard Test Methods for Short-Term Indentation and Residual Indentation of Resilient Floor Covering.
- L. ASTM F2199 - Standard Test Method for Determining Dimensional Stability of Resilient Floor Tile after Exposure to Heat.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate pattern layout plan and grain direction.
- D. Verification Samples: Submit two samples, 12 by 12 inch (____ by ____ mm) in size illustrating color and pattern for each resilient flooring product specified.
- E. Duplicate samples may be required. See section 016000 Product Requirements.
- F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.
- G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

2. Extra Flooring Material: 180 square feet (_____ square meters) of each type and color.
3. Extra Wall Base: 50 linear feet (_____ linear meters) of each type and color.
4. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).
- D. Protect roll materials from damage by storing on end.
- E. Do not double stack pallets.

1.06 WARRANTY

- A. Provide Manufacturer's standard finish and ware warranties for each product specified.

1.07 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).
- B. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Moisture content of concrete slabs and environmental conditions must be within limits recommended by manufacturer of products being installed.

PART 2 PRODUCTS

2.01 TILE FLOORING

- A. Luxury Vinyl Tile; Heterogeneous- Layered product consisting of wearlayer, decorative film, and backing with pre-and post-consumer content (LVT 1 & LVT 2): Collection or Style.
 1. Minimum Requirements: Comply with ASTM F1700, of Class III, Type B.
 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
 3. Size: As indicated on Drawings.
 4. Thickness: .0120 inch (_____ mm).
 5. Wear Layer Thickness: 20 mil (.020")
 6. Finish: Polyurethane reinforced
 7. Pattern: _____; Color as scheduled on Drawings.
 8. Edge Treatment: Square
 9. Emboss: Standard or as indicated on Drawings.
 10. Manufacturers:
 - a. Mannington Mills, Inc; _____: www.mannington.com.
 - b. Substitutions: See Section 016000 - Product Requirements.
- B. Resilient Flooring Tile (RFT): Textile Composite Tile: Kinetex.
 1. Manufacturers:
 2. Size: 24"x24", as indicated on drawings.
 3. Wear Layer: Polyester- applied pattern
 4. Total Thickness: .205 in.
 5. Style: As indicated on drawings.
 6. Color: As indicated on drawings.
 7. Install Method: As indicated on drawings.

2.02 STAIR COVERING

- A. Stair Treads & Risers & Landings (LVT4); full width and depth of stair tread in one piece; tapered thickness; nosing not less than 1-5/8 inch (41 mm) deep.
 1. Manufacturers:

- a. Six Degrees Flooring Surfaces; www.sixdegreesflooring.com
2. Thickness: 3mm//28 mil
3. Nosing: Square (Integrated)
4. Landing: exact match plank LVT
5. Color: As scheduled on drawings
6. Style: Impression
7. Accessories: include visual strip only at stair treads (beginning and ending steps from main floor and landings)

2.03 RESILIENT BASE

- A. Resilient Base (RB1): ASTM F1861, Type TP, rubber, thermoplastic; top set Style B, Cove.
 1. Manufacturers:
 - a. Johnsonite, a Tarkett Company; DURACOVE THERMOPLASTIC RUBBER 1/8" (TYPE TP): www.johnsonite.com/#sle.
 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or ASTM E 648.
 3. Height: 6 inch (150 mm); provide 4 inch at millwork base cabinet locations.
 4. Thickness: 0.125 inch (3.2 mm).
 5. Toe: Yes
 6. Length: Roll.
 7. Color: As indicated on drawings.
 8. Color: To be selected by Engineer/Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION AND TESTING

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Subfloor Surface Testing: Verify that substrates are ready for resilient flooring installation by providing third party testing for relative humidity (ASTM F2170-19a) and alkalinity (ASTM F3441-23).
 1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
 2. If subfloor fails testing, it will be the contractor's responsibility to provide remediation to the subfloor to comply with with required relative humidity and alkalinity at no additional cost to the Owner.
- D. Verify that required floor-mounted utilities are in correct location.
- E. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

3.02 PREPARATION

- A. Vacuum and broom clean substrate.
- B. Apply concrete slab primer if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.
- C. Start of flooring installation indicates acceptance of sub-floor conditions and full responsibility for completed work.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.

3.04 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern or in direction indicated on Drawings.
- C. Install tile floors according to color and pattern as indicated on Drawings. Lay out tile from center of room or area, so that tile at opposite edges of room are at equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters.
- D. Match tile for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, chipped, or deformed tiles are not acceptable.
- E. Lay tile with grain running in one direction; direction as indicated on Drawings.
- F. Sealing/Waxing:
 - 1. For Vinyl Composition Tile (VCT) provide sealer/wax per the manufacturer's installation and/or protection instructions.
 - 2. For Luxury Vinyl Tile (LVT) there will be no waxing/sealing required unless specifically required by the LVT manufacturer. If the submitted LVT requires any waxing/sealing, then the General Contractor will be required to provide.

3.05 INSTALLATION - RESILIENT BASE

- A. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold.
- B. Install base on solid backing. Bond tightly to wall and floor surfaces.
- C. Install base in lengths as long as practicable, with field formed outside corner units, and with mitered or coped inside corners.
- D. On irregular surfaces, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- E. Scribe and fit to door frames and other interruptions.

3.06 INSTALLATION - STAIR COVERINGS

- A. Install stair coverings in one piece for full width and depth of tread.
- B. Install stringers configured tightly to stair profile.
- C. Adhere over entire surface. Fit accurately and securely.

3.07 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.08 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.
- B. Protect solid vinyl tile against damage by covering with plywood or hardboard in high traffic areas and heavy kraft paper in other areas or as recommended by Manufacturer.

END OF SECTION

**SECTION 096722
DECORATIVE RESINOUS FLOORING**

SHERWIN-WILLIAMS HIGH PERFORMANCE FLOORING, RESUFLO DECO

PART 1 GENERAL

2.01 SECTION INCLUDES

- A. Resinous Systems of the Following Types:
 - 1. Sherwin-Williams HPF, Resuflo Deco

2.02 RELATED SECTIONS

- A. Section 03300 – Cast-In-Place Concrete.

2.03 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM C 413 - Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 2. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
 - 3. ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics.
 - 4. ASTM D1475 - Standard Test Method For Density of Liquid Coatings, Inks, and Related Products.
 - 5. ASTM D 2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
 - 6. ASTM D 2240 - Standard Test Method for Rubber Property—Durometer Hardness.
 - 7. ASTM D 2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
 - 8. ASTM D2369 - Standard Test Method for Volatile Content of Coatings.
 - 9. ASTM D 2370 - Standard Test Method for Tensile Properties of Organic Coatings.
 - 10. ASTM D 3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
 - 11. ASTM D 4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
 - 12. ASTM D 4366 - Standard Test Methods for Hardness of Organic Coatings by Pendulum Damping Tests
 - 13. ASTM D5441 - Standard Test Method for Analysis of Methyl Tert-Butyl Ether (MTBE) by Gas Chromatography.
 - 14. ASTM D 7234 - Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
 - 15. ASTM F 1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - 16. ASTM F 2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
 - 17. ASTM G 154 - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.
- B. Deutsches Institut für Normung (DIN):
 - 1. DIN 53460 – Testing of Plastics; Determination of the Vicat Softening Temperature of Thermoplastics.
- C. International Concrete Repair Institute (ICRI):
 - 1. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.
- D. Military Specifications (MIL):
 - 1. MIL-D-3134J - Deck Covering Materials.
- E. National Floor Safety Institute (NFSI):

1. ANSI/NFSI B101.1 - Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.

2.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data:
 1. Manufacturer's data sheets on each product to be used, including properites, VOC content, wet static coefficient of friction, compressive strength, tensile strength, elongation and similar properties.
 2. Preparation instructions and recommendations.
 3. Storage and handling requirements and recommendations.
 4. Typical installation methods.
- C. Verification Samples: Two representative units of each system, including color and texture.
- D. Duplicate samples may be required. See section 016000 Product Requirements.
- E. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.
- F. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- G. Manufacturer's Project References: Submit manufacturer's list of successfully completed resinous flooring system projects, including project name and location, name of architect, and type and quantity of flooring systems furnished.
- H. Applicator's Project References: Submit applicator's list of successfully completed resinous flooring system projects, including project name and location, name of architect, and type and quantity of flooring systems applied.
- I. Care and Maintenance Instructions: Submit manufacturer's care and maintenance instructions, including cleaning instructions.
- J. Submit cove base installation tools recommended by manufacturer.

2.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.
- B. Applicator's Qualifications:
 1. Applicator regularly engaged, for a minimum of 5 years, in application of resinous flooring systems of similar type to that specified.
 2. Employ persons trained for application of resinous flooring systems.
- C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
- D. Mock-Up: Construct a 4'x4' minimum mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
 1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
 2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
 3. Retain mock-up during construction as a standard for comparison with completed work.
 4. Do not alter or remove mock-up until work is completed or removal is authorized.
 5. Include integral cove base if specified in drawings. Use manufacturer recommended cove base installation tools necessary for consistent radius transition.

2.06 PRE-INSTALLATION CONFERENCE

- A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

2.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, and batch number.
- B. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until application.
 - 3. Store materials in clean, dry area indoors between 65 and 80 degrees F (18 and 27 degrees C).
 - 4. Store materials out of direct sunlight.
 - 5. Keep materials from freezing.
 - 6. Protect materials during storage, handling, and application to prevent contamination or damage.

2.08 PROJECT CONDITIONS

- A. Apply flooring system under the following ambient conditions:
 - 1. Ambient and Concrete Floor Temperatures: Between 65 and 85 degrees F (18 and 29 degrees C).
 - 2. Material Temperature: Between 65 and 85 degrees F (18 and 29 degrees C).
 - 3. Relative Humidity: Maximum 80 percent.
 - 4. Dew Point: Floor temperature more than 5 degrees over dew point.
- B. Do not apply flooring system under ambient conditions outside manufacturer's limits.

2.09 WARRANTY

- A. Submit manufacturer's standard warranty.

PART 2 PRODUCTS**3.01 MANUFACTURERS**

- A. Acceptable Manufacturer: The Sherwin-Williams High Performance Flooring, 866-540-1299
swflooring@sherwin.com Website: <https://industrial.sherwin-williams.com/na/us/en/resin-flooring.html>
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

3.02 SHERWIN-WILLIAMS HPF, RESUFLO DECO QUARTZ ONE

- A. Resuflor Deco Quartz One
 - 1. Required Primer: Resuprime 3579 at 200-300 sq. ft. per gallon
 - 2. Bodycoat: Resuflor MPE at 133-160 sq. ft. per gallon.
 - 3. Broadcast (1): 5900F Decorative Quartz at 400 lbs. per 1,000 sq. ft.
 - 4. Bodycoat: Resuflor MPE at 65-70 sq. ft. per gallon.
 - 5. Broadcast (2): 5900F Decorative Quartz at 400 lbs. per 1,000 sq. ft.
 - 6. Grout Coat: Accelera One at 100 sq. ft. per gallon.
 - 7. Seal Coat: Accelera One at 200 sq. ft. per gallon.
 - 8. Color: As selected by Architect from manufacturer's full range.

PART 3 EXECUTION**4.01 EXAMINATION**

- A. Examine concrete surfaces to receive flooring system. Verify concrete is structurally sound.
- B. Moisture Testing of Concrete: Perform at least one of the following two tests to determine moisture in concrete. Type of test and frequency as recommended by manufacturer and installer.
 - 1. In-situ Probe Test:
 - a. Measure relative humidity in concrete in accordance with ASTM F 2170.
 - b. Application of flooring system shall start only if test results are below 75 percent relative concrete humidity.
 - c. If test results are above limits, notify Architect and flooring manufacturer in writing.
- C. Do not begin preparation or installation until satisfactory moisture test results are achieved. Provide flooring manufacturer's recommended moisture vapor control coating if required.

4.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

- B. Protection of In-Place Conditions: Protect adjacent surfaces and adjoining walls from contact with flooring system materials.
- C. Surface Preparation:
 - 1. Prepare concrete surface in accordance with manufacturer's instructions.
 - 2. Remove dirt, dust, debris, oil, grease, curing agents, bond breakers, paint, coatings, sealers, silicones, and other surface contaminants which could adversely affect application of flooring system.
 - 3. Steel shot blast concrete to a minimum surface profile of ICRI 310.2R, CSP 5.
 - 4. Key-cut termination points with 1/4-inch (6-mm) by 1/4-inch (6-mm) cut.
 - 5. Patch depressions, divots, and cracks in concrete in accordance with manufacturer's instructions.
 - 6. Mechanically remove loose, delaminated, and damaged concrete and repair in accordance with manufacturer's instructions.
 - 7. Joints: Fill joints in accordance with manufacturer's instructions.

4.03 INSTALLATION

- A. Install flooring system in accordance with manufacturer's instructions and approved submittals at locations indicated on the Drawings.
- B. Ensure concrete is dry, clean, and prepared in accordance with manufacturer's instructions.
- C. Allow concrete to cure a minimum of 7 days before applying flooring system.
- D. Mixing:
 - 1. Mix material components together in accordance with manufacturer's instructions.
 - 2. Mix only enough material that can be applied within working time.
 - 3. Add and mix colorants with materials in accordance with manufacturer's instructions to achieve uniform color.
- E. Apply flooring system materials to obtain consistent mil thickness and smooth, uniform appearance and texture.
- F. Overlay: Apply overlay in accordance with manufacturer's instructions. Apply overlay to prepared concrete surface.
- G. Traction Aggregate: Broadcast traction aggregate in accordance with manufacturer's instructions. Broadcast traction aggregate into wet overlay.
- H. Cove:
 - 1. Apply cove primer and cove in accordance with manufacturer's instructions at locations indicated on the Drawings.
 - 2. Apply cove to height and shape as indicated on the Drawings.
 - 3. Apply cove to create seamless, smooth transition between flooring and walls.
 - 4. Use integral cove installation tools recommended by manufacturer to provide an even curved radius cove transition.
 - 5. Use metal cove top cap L-trim to create a straight clean edge and caulk color matched to painted wall substrate. Apply trim so that it is properly secured to substrate.
- I. Seal Coat:
 - 1. Apply seal coat in accordance with manufacturer's instructions.
 - 2. Apply seal coat over traction aggregate.

4.04 FIELD QUALITY CONTROL

- A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.
- B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

4.05 CLEANING AND PROTECTION

- A. Allow flooring system to dry in accordance with manufacturer's instructions before opening to traffic.
- B. Allow flooring system to dry a minimum of 1 week before cleaning by mechanical means.

- C. Protect completed flooring system from damage during construction.

END OF SECTION

SECTION 096723
SOLID RESINOUS FLOORING SYSTEM**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes:
 - 1. High-performance resinous flooring systems.

1.02 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Installer Certificates for Qualification: Signed by manufacturer certifying that installers comply with specified requirements.
- C. Material Certificates: For each resinous flooring component, from manufacturer.
- D. Material Test Reports: For each resinous flooring system.
- E. Maintenance Data: For maintenance manuals.
- F. Samples: Submit one sample of coating, indicating coating applied on horizontal surfaces. Sample shall illustrate transition from Resinous Flooring system. Provide sample which is a true representation of proposed field applied finish; not laboratory applied finish. Provide minimum 12 feet by 4 feet field sample color and texture for owner approval as a mock up at location designated by General Contractor for review and written approval prior to installation of any other areas.
- G. Product Schedule: For resinous flooring.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
 - 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
 - 2. Installer Letter of Certification: Installer to provide letter stating that they have been in business for at least 10 years and listing 5 projects in the last 2 years of similar scope. For each project provide: project name, location, date of installation, contact information, size of project, and manufacturer of materials with system information.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- C. Pre-installation Conference: Conduct conference at Project site before work and mockups begin.
- D. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Do not cover up mockup area.
 - 1. Apply full-thickness mockups on 16 square foot floor area selected by Architect.
 - 2. Simulate finished lighting conditions for Architect's review of mockups.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
 - 4. Mockup shall demonstrate desired slip resistance for review and approval by General Contractor prior to installing project areas.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.05 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. The Sherwin-Williams Company

2.02 MATERIALS

- A. Sherwin-Williams Poly-Crete MD (self leveling) topcoat seamless flooring system.
- B. System Materials:
 - 1. Flexible Membrane- 2 coats Resuflor 3555 at 20 mil
 - a. broadcast 2040 sand mix into final coat
 - 2. Primer: Sherwin-Williams Poly-Crete TF Plus, resin, hardener and aggregate.
 - 3. Topping: Sherwin-Williams Poly-Crete MD, resin, hardener and aggregate.
- C. Patch Materials
 - 1. Shallow Fill and Patching: Use Poly-Crete MD (up to ¼ inch).
 - 2. Deep Fill and Sloping Material (over ¼ inch): Use Cemlack UM, Poly-Crete WR or Cemlack LM.
- D. Product System Requirements:
 - 1. Primer Poly-Crete TF Plus

a. Percent Solids	100 %
b. VOC	0 g/L
c. Compressive Strength ASTM C 579	7,250 psi
d. Tensile Strength, ASTM D 638	750 psi
e. Flexural Strength ASTM D 790	4,400 psi
f. Abrasion Resistance, ASTM C 501	
g. H 10 Wheel, 1,000 gm load, 1,000 cycles	40 mg weight loss
h. Hardness, Shore D	85
i. Potlife 1 gal @ 77 F	15 minutes
 - 2. Topping: Poly-Crete MD

a. Percent Reactive	100 %
b. VOC	0 g/L
c. Bond Strength to Concrete ASTM D 4541	>400 psi, substrates fails
d. Compressive Strength, ASTM C 579	8,990 psi
e. Tensile Strength, ASTM D 638	2,175 psi
f. Impact Resistance @ 125 mils, MIL D-3134,	>160 inch lbs
g. No visible damage or deterioration	
- E. Preparation
- F. Inspection: Prior to commencing Work, thoroughly examine all underlying and adjoining work, surfaces and conditions upon which Work is in any way dependent for perfect results. Report all conditions which affect Work. No "waiver of responsibility" for incomplete, inadequate or defective underlaying and adjoining work, surfaces and conditions will be considered, unless notice of such unsatisfactory conditions has been filed and agreed to in writing before Work begins. Commencement of Work constitutes acceptance of surfaces. Test and report for moisture level in substrate to verify compliance with manufacturer's requirements. Do not proceed unless acceptable test results are achieved.
- G. Only installers approved by the manufacturer in writing shall perform installation of the material.

- H. Surface Preparation: Remove all surface contamination, loose or weakly adherent particles, laitance, grease, oil, curing compounds, paint, dust and debris by blast track method or approved mechanical means (acid etch not allowed). If surface is questionable try a test patch. Create a minimum surface profile for the system specified in accordance with the methods described in ICRI No. 03732 to achieve profile numbers as follows:
- I. All applicators and all other personnel in the area of the RF installation shall take all required and necessary safety precautions. All manufacturers' installation instructions shall be implicitly instructions shall be implicitly followed.
- J. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
- K. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- L. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- M. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- N. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

(1) Applications

- O. Install resinous floor over properly prepared concrete surface in strict accordance with the manufacturer's directions.
- P. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
- Q. Sealant: Saw cut resinous floor topping at expansion joints in concrete slab. Fill sawcuts with sealant prior to final seal coat application. Follow manufacturer's written recommendations.
- R. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- S. Slip Resistant Finish: Provide grit for slip resistance.
- T. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

(1) Completed Work

- U. Cleaning: Upon completion of the Work, clean up and remove from the premises surplus materials, tools, appliances, empty cans, cartons and rubbish resulting from the Work. Clean off all splatterings and drippings, and all resulting stains.
- V. Protection: Protect Work in accordance with manufacturer's directions from damage and wear during the remainder of the construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.
- W. Contractor shall insure that coating is protected from any traffic until it is fully cured to the satisfaction of the coating manufacturer.

END OF SECTION

SECTION 096813
TILE CARPETING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Carpet tile, fully adhered, direct glue down.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate layout of joints, direction of carpet pile, and location of edge moldings.
- D. Samples: Submit four carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Duplicate samples may be required. See section 016000 Product Requirements.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.
- C. Flame Spread Rating: Carpeting shall have a flame spread rating of 75 or less in accordance with ASTM E84-68, Standard Method of Test for Surface Burning Characteristics of Building Materials or pass the National Bureau of Standards Radiant Panel Test.

1.04 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

1.05 WARRANTY

- A. Provide Manufacturer's standard warranties as follows: Lifetime Limited Carpet Tile Warranty, Lifetime Limited Colorfastness to Light, 10 year Limited Colorfastness to Atmospheric Contaminants, 10 Year Stain Warranty.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Tile Carpeting:
 - 1. EF Contract Flooring; www.efcontractflooring.com
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

- A. Tile Carpeting: Tufted, manufactured in one color dye lot.
 - 1. Color: As chosen by Architect.
 - 2. Pattern: As chosen by Architect. Allow 2 patterns per space.
 - 3. Construction
 - a. Tufted, Textured Loop
 - 4. Tile Size
 - a. 24"x24"
 - 5. Yarn Type
 - a. Universal Fibers® Solution-Dyed Nylon
 - b. Type 6,6
 - 6. Stain Repel / Stain Resist / Soil Release

- a. StainSmart®
- 7. Tufted Face Weight
 - a. 27 oz/yd²
- 8. Gauge
 - a. 1/12
- 9. Average Density (Finished)
 - a. 10,340
- 10. Standard Backing
 - a. Nexus Modular
- 11. Nominal Total Thickness
 - a. 0.245"
- 12. Methenamine Pill Test (CPSC FF-1-70 or ASTM D 2859)
 - a. Self-Extinguishing

2.03 ACCESSORIES

- A. Edge Strips: Rubber, As scheduled on Drawings or color as selected by Architect.
- B. Adhesives:
 - 1. Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified.
- C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer.
- D. Miscellaneous Materials: As recommended by manufacturer of carpet tile and selected by installer to meet project circumstances and requirements for a complete installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 - 1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Vacuum clean substrate.
- C. Pre-ventilate carpet in a well ventilated, uninhabited space for a minimum of 5 hours prior to installation.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
- F. Fully adhere carpet tile to substrate.
- G. Trim carpet tile neatly at walls and around interruptions.
- H. Complete installation of edge strips, concealing exposed edges.
- I. Trim edges and butter cuts with seaming cement.
- J. Roll carpet lightly to eliminate air pockets and ensure uniform bond. Remove adhesive promptly from face of carpet.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.
- C. Remove any soiled spots in carpet. Replace carpet where spots can not be removed.

3.05 PROTECTION

- A. Contractor is to use protection method and materials required to ensure carpet is protected throughout remaining construction and is without deterioration or damage at time of substantial completion.

END OF SECTION

SECTION 099113
EXTERIOR PAINTING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Non-metallic roofing and flashing.
 - 6. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, zinc, and lead.
 - 7. Marble, granite, slate, and other natural stones.
 - 8. Floors, unless specifically indicated.
 - 9. Ceramic and other types of tiles.
 - 10. Glass.
 - 11. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- E. SSPC V1 (PM1) - Good Painting Practice: Painting Manual Volume 1; 2024.
- F. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- G. SSPC-SP 2 - Hand Tool Cleaning; 2024.
- H. SSPC-SP 3 - Power Tool Cleaning; 2024.
- I. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.
- J. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete; 2018.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Engineer/Architect before preparing samples, to eliminate sheens not required.

3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as factory finished metals, have been approved.
- D. Samples: Submit two paper chip samples, 8x8 inch (____x____ mm) in size illustrating range of colors and textures available for each surface finishing product scheduled.
- E. Duplicate samples may be required. See section 016000 Product Requirements.
- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, care and cleaning instructions, repair of painted and finished surfaces, and color samples of each color and finish used. Finish Schedule is not required if it matches the Construction Documents.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 1. If a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Engineer/Architect is obtained using the specified procedures for substitutions.
 2. Substitution of a different paint system using Basis of Design products by the same manufacturer will be considered.
- B. Paints:
 1. Sherwin-Williams Company; <>: www.sherwin-williams.com. Basis of Design.
- C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 2. DOOR SLABS, DOOR FRAMES, AND OPENING FRAMES TO BE FIELD PAINTED MUST BE SPRAYED. BRUSH OR ROLLED APPLICATION WILL NOT BE ACCEPTED. If brushed or rolled,

- then the contractor will be required to strip and/or replace the product or installation in question and repaint, which will be up to the Architect's discretion with no fault to the Architect or Owner and without time or monetary compensation to the Contractor.
3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Engineer/Architect from the manufacturer's full line.
- E. Colors: As indicated in Color Schedule.
1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
 2. Extend colors to surface edges; colors may change at any edge as directed by Engineer/Architect.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Exterior Metal Surfaces to be Painted, Unless Otherwise Indicated: Including primed metal.
1. Two top coats and one coat primer.
 2. Top Coat(s):
 - a. Semi-Gloss Finish: Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, Semi-Gloss, B53-1150 Series or Equal.
 3. Primer: As recommended by top coat manufacturer for specific substrate. Block Filler is required at all CMU locations.
- B. Exterior CMU.
1. Two top coats and one block filler coat.
 2. Top Coat(s): Sherwin Williams Loxon XP Waterproofing Masonry Coating, LX11 Series or Equal (14.5 mils wet, 6.5 mils dry per coat).
 3. Block Filler: Sherwin Williams Pro Industrial Heavy Duty Block Filler, B42W150 or Equal.
- C. Brick, Masonry, and Concrete
1. Prep: Ensure it's clean, dry, and free of loose or foreign debris.
 2. Primer: Loxon Acrylic Conditioner. Use at existing coatings or lightly chalked surfaces.
 3. Primer: Loxon Concrete and Masonry Primer LX2W50. Use at bare concrete surfaces.
 4. Paint: 2 coats Loxon XP
 5. Color: Architect to choose from manufacture's standard colors unless specifically called out on the drawings.
 6. Sheen: Flat

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Alkali-Resistant Water-Based Primer; MPI #3.
 2. Interior/Exterior Latex Block Filler; MPI #4.

3. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
4. Water Based Primer for Galvanized Metal; MPI #134.
5. Rust-Inhibitive Water Based Primer; MPI #107.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. If substrate preparation is the responsibility of another installer, notify Engineer/Architect of unsatisfactory preparation before proceeding.
- D. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete:
 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 2. Prepare surface as recommended by top coat manufacturer and in accordance with SSPC-SP 13/NACE No.6.
- H. Masonry:
 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 2. Prepare surface as recommended by top coat manufacturer.
 3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi (4,140 to 10,350 kPa) at 6 to 12 inches (150 to 300 mm). Allow to dry.
 4. Existing Masonry:
 - a. If moss has accumulated on damp, shaded masonry, apply an ordinary weed killer. Wet the wall with clear water before applying weed killers to prevent them from being drawn into the wall. Chemical weed killers may contain solubles which can contribute to efflorescence or react unfavorably with paint, and should be removed after being used by scrubbing the wall with a stiff brush while rinsing with clear water.
 5. Existing Painted Masonry.
 - a. 3 oz trisodium phosphate (Soilax, Spic and Span, etc.), plus
 - b. 1 oz detergent (Tide, All, etc.), plus
 - c. 1 qt 5 per cent sodium hyperchlorite (Chlorox, Purex, etc.), plus
 - d. 3 qt warm water, or enough to make 1 gal of solution.

- e. Use this solution to remove mildew and dirt. Scrub with a medium soft brush until the surface is clean; then rinse thoroughly with fresh water. For small areas, use an ordinary household cleanser. Scrub with a medium soft brush and then rinse thoroughly. Use masonry paints containing a mildewcide to help prevent molds from recurring.
 - f. Remove all peeled, cracked, flaked or blistered paint by scraping, wire brushing or sand blasting. In some instances, old paint may be burned off, but this should be done only by skilled operators. Like efflorescence, paint blistering is caused by water within the masonry. Search for the water's source and take the necessary corrective measures to keep water out of the wall.
 - g. If alligating exists, remove the entire finish. There is no other means of correction.
 - h. If slight chalking has occurred, brush the surface thoroughly. However, if chalking is deep, remove by scrubbing with a stiff fiber brush and a solution of trisodium phosphate and water. Rinse the surface thoroughly afterwards. with a stiff fiber brush and a solution of trisodium phosphate and water. Rinse the surface thoroughly afterwards.
 - i. Excessive paint buildup results from too many coats or excessively thick coats. Where it occurs, remove all paint and treat as a new surface.
 - j. Completely remove cement-based paints before repainting with other types. An exception to this rule is the use of cement-based paints as primers which will be covered by another paint within a relatively short time. If the wall will be repainted with another cement-based paint, wire brushing and scrubbing will suffice, providing treatments for mildew, efflorescence, etc. are not required.
- I. Galvanized Surfaces:
- J. Ferrous Metal:
- 1. Solvent clean according to SSPC-SP 1.
 - 2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.
- K. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
- I. DOOR SLABS, DOOR FRAMES, AND OPENING FRAMES TO BE FIELD PAINTED MUST BE SPRAYED. BRUSH OR ROLLED APPLICATION WILL NOT BE ACCEPTED. If brushed or rolled, then the contractor will be required to strip and/or replace the product or installation in question and repaint, which will be up to the Architect's discretion with no fault to the Architect or Owner and without time or monetary compensation to the Contractor.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 099123
INTERIOR PAINTING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Roof access ladders.
 - 3. Prime surfaces to receive wall coverings.
 - 4. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - d. Paint dampers exposed behind louvers, grilles, to match face panels.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Ceramic and other tiles.
 - 7. Glass.
 - 8. Concealed pipes, ducts, and conduits.

1.02 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.
- C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.
- D. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.
- E. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.
- F. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- G. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- H. SSPC V1 (PM1) - Good Painting Practice: Painting Manual Volume 1; 2024.
- I. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- J. SSPC-SP 2 - Hand Tool Cleaning; 2024.

- K. SSPC-SP 3 - Power Tool Cleaning; 2024.
- L. SSPC-SP 13 - Surface Preparation of Concrete; 2018.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 - 2. MPI product number (e.g., MPI #47).
 - 3. Cross-reference to specified paint system products to be used in project; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Engineer/Architect before preparing samples, to eliminate sheens not required.
 - 3. Allow 10 days for approval process, after receipt of complete samples by Engineer/Architect.
 - 4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Duplicate samples may be required. See section 016000 Product Requirements.
- E. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- F. Manufacturer's Instructions: Indicate special surface preparation procedures.
- G. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used. Finish Schedule is not required if it matches the Construction Documents.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gal (4 L) of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience and approved by manufacturer.

1.06 MOCK-UP

- A. See Section 042000 Unit Masonry for mock up details.
- B. Provide in place mock up, illustrating paint color, texture, and finish at interior spaces as indicated CMU if applicable. Include temporary lighting for Architect review.
- C. Mock-up may remain as part of the work.

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.

- D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Engineer/Architect is obtained using the specified procedures for substitutions.
 - 2. Substitution of a different paint system using Basis of design products by the same manufacturer will be considered.
- B. Paints:
 - 1. Sherwin-Williams Company: www.sherwin-williams.com. Basis of Design.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
 - 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 - 2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 3. DOOR SLABS, DOOR FRAMES, AND OPENING FRAMES TO BE FIELD PAINTED MUST BE SPRAYED. BRUSH OR ROLLED APPLICATION WILL NOT BE ACCEPTED. If brushed or rolled, then the contractor will be required to strip and/or replace the product or installation in question and repaint, which will be up to the Architect's discretion with no fault to the Architect or Owner and without time or monetary compensation to the Contractor.
 - 4. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 5. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Architectural coatings VOC limits of the State in which the Project is located.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Engineer/Architect from the manufacturer's full line.
- E. Colors: As indicated on drawings.
 - 1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
 - 2. Extend colors to surface edges; colors may change at any edge as directed by Engineer/Architect.
 - 3. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.03 PAINT SYSTEMS - INTERIOR

- A. Non Wet Area/Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat Sheen:
 - a. Flat: Use this sheen for ceilings and other overhead surfaces.
 - 1) Flat: S-W ProMar® 200 Zero VOC Latex Flat, B30-12600 Series or Equal
 - 2) (4.0 mils wet, 1.4 mils dry per coat)
 - b. Eggshell: Use this sheen at walls.
 - 1) Eg-shel: S-W ProMar® 200 Zero VOC Latex Eg-Shel, B20-12600 Series or Equal
 - 2) (4.0 mils wet, 1.7 mils dry per coat)
 - c. Semi-Gloss: Use this sheen for items subject to frequent touching by occupants, including door frames and railings.
 - 1) Semi-Gloss: S-W ProMar® 200 Zero VOC Latex Semi-Gloss, B31-2600 Series or Equal
 - 2) (4.0 mils wet, 1.5 mils dry per coat).
 - 3. Primer:
 - a. S-W ProMar 200 Zero VOC Latex Primer, B28W2600 or Equal
 - b. (4.0 mils wet, 1.0 mils dry).
- B. Interior Surfaces to be Painted, Unless Otherwise Indicated: CMU.
 - 1. Block Filler, intermediate coat and finish coat.
 - 2. Intermediate Coat: Sherwin Williams Tuff Surface Premium Texture Finish sales number 6504-21571. Apply with a hopper to orange peel texture.
 - 3. Top Coat Product(s):
 - a. Sherwin Williams Promar 200s/g, B31-2600 or equal. Provide epoxy based latex at wet areas.
 - 4. Block Filler: Sherwin Williams Pro Industrial Heavy Duty Block Filler, B42W150 (16.0 mils wet, 8.0 mils dry)
- C. Non Wet Area: Gypsum Board Upgrade.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat Sheen:
 - a. Eg-Shel: Sherwin Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-1150 Series or Equal.
 - b. Semi-Gloss: Sherwin Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-1150 Series or Equal.
 - c. Primer: S-W ProMar 200 Zero VOC Latex Primer, B28W2600 or Equal (4.0 mils wet, 1.0 mils dry).
- D. Non Wet Area: CMU Upgrade.
 - 1. Block Filler, intermediate coat and finish coat.
 - 2. Intermediate Coat: Sherwin Williams Tuff Surface Premium Texture Finish sales number 6504-21571. Apply with a hopper to orange peel texture.
 - 3. Top Coat Sheen:
 - a. Eg-Shel: Sherwin Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-1150 Series or Equal.
 - b. Semi-Gloss: Sherwin Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-1150 Series or Equal.
 - 4. Block Filler: Sherwin Williams Pro Industrial Heavy Duty Block Filler, B42W150 or Equal. (16.0 mils wet, 8.0 mils dry)
- E. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
 - 1. Medium duty applications include doors and door frames.
 - 2. Two top coats and one coat primer.
 - 3. Top Coat Sheen: Semi-Gloss: Use this sheen at all locations.
 - a. Sherwin Williams Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss, B53-1150 or Equal. (4.0 mils wet, 1.4 mils dry per coat).
 - 4. Primer: Sherwin Williams Pro Industrial Pro-Cryl Universal Metal Primer, B66 Series or Equal (5.0 mils wet, 1.9 mils dry).

- F. Wet Area Medium Duty Vertical and Overhead: Including gypsum board.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat Sheen:
 - a. Eg-Shel: Use this sheen at all locations.
 - b. Eg-Shel: Sherwin Williams Pro Industrial Waterbased Catalyzed Epoxy, B73-360 Series or Equal (5.0 mils wet, 2.0 mils dry per coat).
 - 3. Primer: Sherwin Williams Pro Industrial Pro-Cryl Universal Metal Primer, B66 Series or Equal (5.0 mils wet, 1.9 mils dry).
- G. CSC - Solid Color Finish for Concrete Floors
 - 1. Urethane Coating for [concrete floors]:
 - 2. Products: Sherwin-Williams; ArmorSeal Rexthane Moisture Cured Urethane: www.protective.sherwin-williams.com/
 - 3. Top Coat(s): Polyurethane Varnish, Moisture Cured;
 - 4. Color as chosen by Architect from manufacturer's standard colors.
 - 5. Sheen: Gloss
- H. SC - Transparent Finish on Concrete Floors: Satin Finish.
 - 1. Product: H&C ClariShield Solvent-Based Natural Look Sealer or approved equal.
 - 2. Coats: 2 coats sealer.
 - 3. Color: Clear
 - 4. Sheen: Satin
- I. Interior Painted Wood:
 - 1. Two top coats and one coat primer.
 - 2. Top Coat Sheen:
 - a. Semi-Gloss: Sherwin Williams Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss, B53-1150 or Equal (4.0 mils wet, 1.4 mils dry per coat).
 - 3. Primer: Sherwin Williams Pro Industrial Pro-Cryl Universal Metal Primer, B66 Series or Equal (5.0 mils wet, 1.9 mils dry).
- J. Interior Painted Signage: stencil applied
 - 1. Waterbased Urethane
 - 2. Product: Sherwin Williams; Pro Industrial Acrolon 100
 - 3. Two top coats and one coat primer

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been adequately prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Engineer/Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 - 2. Clean concrete according to ASTM D4258. Allow to dry.
 - 3. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- H. Masonry:
 - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 - 2. Prepare surface as recommended by top coat manufacturer.
- I. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- J. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- K. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- L. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- M. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- F. Sand wood and metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 101100
VISUAL DISPLAY UNITS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Markerboards and Tackboards.

1.02 RELATED REQUIREMENTS**1.03 REFERENCE STANDARDS**

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data on chalkboard, porcelain enamel steel markerboard, glass markerboard, tackboard, tackboard surface covering, trim, and accessories.
- C. Samples: Color charts for selection of color and texture of chalkboard, porcelain enamel steel markerboard, glass markerboard, tackboard, tackboard surface covering, and trim.
- D. Duplicate samples may be required. See section 016000 Product Requirements.
- E. Manufacturer's printed installation instructions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for chalkboard and markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Visual Display Boards:
 - 1. MooreCo, Inc: www.moorecoinc.com.
 - 2. Claridge Products and Equipment, Inc: www.claridgeproducts.com.
 - 3. Quartet; www.quartet.com.

2.02 VISUAL DISPLAY UNITS

- A. Markerboards: Porcelain enamel on steel, laminated to core, Magnetic.
 - 1. Basis of Design: Claridge Series #4
 - 2. Color: White.
 - 3. Size: As indicated on drawings.
 - 4. Frame: Extruded aluminum , with concealed fasteners.
 - 5. Frame Finish: Anodized, natural.
 - 6. Accessories: Provide chalk tray and map rail.; provide end stops and metal clips for map rail.
 - 7. Trim: Sation Anodized aluminum trim
- B. Tackboards: 800 Series with Designer Fabric by Claridge Products.
 - 1. Fabric: Designer Series Fabric.
 - 2. Color: I684 Noir.
 - 3. Backing: Hardboard, 1/4 inch (6 mm) thick, laminated to tack surface.
 - 4. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
 - 5. Size: As indicated on drawings.
 - 6. Frame: Extruded aluminum , with concealed fasteners.
 - 7. Frame Profile: 5/8" face with mitered corners

8. Frame Finish: Anodized, Aluminum Satin.

2.03 MATERIALS

2.04 ACCESSORIES

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall (; 25 mm wide overall) , full width of frame.
- B. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, concealed fasteners, same finish as frame.
- C. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.

3.02 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Secure units level and plumb.

3.03 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.

END OF SECTION

**SECTION 101416
PLAQUES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Plaques.

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's product literature for each type of plaque sign, indicating style, font, foreground and background colors, locations, and overall dimensions of each sign.
- C. Shop Drawings: Indicate dimensions, locations, elevations, materials, text and graphic layout, and attachment details.
- D. Manufacturer's qualification statement if other than company specified herein.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience if other than company specified herein.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package plaque signs as required to prevent damage before installation.
- B. Store under cover and elevated above grade.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Plaques:
 - 1. Gemini Plaques.
 - 2. A.R.K Ramos Architectural Signage: <https://arkramos.com/>
 - 3. Substitutions: See Section 016000 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 PLAQUES

- A. Metal Plaques:
 - 1. Material: Aluminum casting.
 - 2. Material Thickness: 1/4 inch (____ mm), minimum.
 - 3. Size: 24 inches by 36 inches (____ mm by ____ mm) unless indicated/represented otherwise on the drawings..
 - 4. Custom Graphics/Logos/Inserts: As indicated on the drawings. Architect will provide vector graphics for sign production.
 - 5. Text and Typeface:
 - a. Character Font: Helvetica, Arial, or other sans serif font unless indicated/represented otherwise on the drawings.
 - b. Character Case: Upper case only unless indicated/represented otherwise on the drawings..
 - c. Character Color: Contrast with background color.
 - 6. Border Style: Double line or as indicated on the drawings.

7. Background Texture: Pebble.
8. Surface Finish: Brushed, satin.
9. Protective Coating: Manufacturer's standard clear coating.
10. Mounting: Blind studs.

2.04 ACCESSORIES

- A. Concealed Screws: Noncorroding metal; stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Notify Engineer/Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.
- C. Locate plaque signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until substantial completion; repair or replace damaged items.

END OF SECTION

**SECTION 101419
DIMENSIONAL LETTER SIGNAGE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Dimensional letter signage.
- B. Illumination system.

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 879 - Electric Sign Components; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.
- C. Shop Drawings:
 - 1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.
 - 2. Show locations of electrical service connections.
 - 3. Include diagrams for power, signal, and control wiring.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package dimensional letter signs as required to prevent damage before installation.
- B. Store under cover and elevated above grade.
- C. Store tape adhesive at a normal room temperature of 68 to 72 degrees F (20 to 22 degrees C).

1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Dimensional Letter Signs:
 - 1. Takeform; ____: www.takeform.net/#sle.
 - 2. ASI Signage; www.asisignage.com/.

2.02 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 DIMENSIONAL LETTERS

- A. Applications: Building identification.
 - 1. Use individual metal letters.
 - 2. Mounting Location: Exterior as indicated on drawings.

3. Text/Verbiage: As indicated on the drawings.
- B. Metal Letters:
 1. Material: Aluminum sheet, fabricated reverse channel.
 2. Thickness: 1/8 inch minimum (3 mm).
 3. Letter Height: As indicated on drawings.
 4. Text and Typeface:
 - a. Character Font: Helvetica, Arial, or other sans serif font unless indicated/represented otherwise on the drawings.
 - b. Character Case: Upper case only unless indicated/represented otherwise on the drawings.
 5. Finish: Brushed, satin.
 6. Color: As selected by Architect from manufacturer's full range.
 7. Mounting: Concealed screws.
 8. Illumination System: Halo-lit reverse channel letters.
 - a. Provide products that are listed and labeled as complying with UL 879, where applicable.
 - b. Power: As indicated on Drawings.
 9. Building Address Numbers: Whether called for on the drawings or not, the contractor will be required to provide no less than five (5) six (6) inch high numbers to be mounted on the street side of the building to comply with the requirements of the local fire department. Final location of the address numbers will need to be verified with the Architect prior to installation. Provide all necessary blocking required for proper installation. Mounting to be concealed screws.

2.04 ACCESSORIES

- A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.
- B. Electrical Components and Devices: Listed and labeled as defined in NFPA 70 by a qualified testing agency.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify that electrical service is correctly sized and located to accommodate dimensional letter signs.
- C. Notify Engineer/Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.
- C. Locate dimensional letter signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until substantial completion; repair or replace damaged items.

END OF SECTION

**SECTION 101423
PANEL SIGNAGE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Panel signage.

1.02 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.
- C. Shop Drawings:
 - 1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
 - 2. Include a scaled floor plan indicating locations that all signs will be installed. A digital markup of the Architect's original digital print file is acceptable. The markup must be clearly noticeable and legible using contrasting colors as needed.
 - 3. Include a scaled legible elevation of EVERY sign even if the name of the sign is duplicated. The elevation must describe the sign location that refers back to the floor plan required under 1.03-C-2 herein, the room name, the room number, and any associated global or room specific graphics.
 - 4. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - b. When content of signs is indicated to be determined later, request such information from Owner through Engineer/Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - c. Submit for approval by Owner through Engineer/Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.
- E. Duplicate samples may be required. See section 016000 Product Requirements.
- F. Provide a physical on-the-job- sample for each signage type upon request.
 - 1. Final color, lettering, and numbering designations to be complete prior to on-the-job- sample production.
 - a. If approved, on-the-job- sample may be used as final signage for specific location of sample.
- G. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.
- H. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- I. Manufacturer's qualification statement.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.

- C. Store under cover and elevated above grade.
- D. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Panel Signage:
 - 1. Mohawk Sign Systems, Inc; Mowhawk 1000 ADA System, Series 200A Sand Carved:
www.mohawksign.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 PANEL SIGNAGE

- A. Panel Signage:
 - 1. Application: Room and door signs.
 - 2. Description: Flat signs with sand blasted plastic panel media, tactile characters.
 - 3. Sign Size and Graphic Requirements:
 - a. Non Graphic / Non Insert room function and room number only signs: 3" tall x length as required.
 - b. Classroom Signs: M-310-B with two windows. Window inserts by Owner. Sign size, 6" x 6".
 - c. Restroom Signs shall be size 8" x 8" with symbols listed below and the verbal description placed directly below followed by Grade 2 braille.
 - 1) Adult Restroom Signage:
 - (a) Men: MS 1
 - (b) Women: MS 2
 - (c) Unisex: MS 5
 - d. Elevator Signs shall be size 8" x 8" with MS 13 symbol and the verbal description placed directly below followed by Grade 2 braille.
 - e. Stair Signs shall be size 8" x 8" with MS 9 symbol and the verbal description placed directly below followed by Grade 2 braille.
 - f. Janitor Room Signs shall be size 8" x 8" with MS 25 symbol and the verbal description placed directly below followed by Grade 2 braille.
 - g. Electrical Room Signs shall be size 8" x 8" with MS 28 symbol and the verbal description placed directly below followed by Grade 2 braille.
 - h. Office Room Signs and others requiring Insert shall be 8"x8" with verbal description and followed by Grade 2 braille.
 - 1) 1/16" clear matte acrylic insert holder, (indicate size) top and bottom bands for insert to attach to panel w/ T&B spacers for insert.
 - i. Maximum Occupancy Posting Signs shall be 4"x8" with verbal description and followed by Grade 2 braille.
 - 1) Section 1004.9 of the International Building Code (IBC) mandates that every room or space with an assembly occupancy have a posted occupant load, near the main exit, in a conspicuous location. The sign must be legible, permanent, and maintained by the owner or their authorized agent.
 - 4. Size of letters and numbers shall be as follows:
 - a. Room numbers shall be 1" tall.
 - b. Lettering for room ID signs shall be 3/4" tall.
 - c. Symbol size shall be 4" tall.

- d. Standard Grade 2 braille shall be 1/2" below copy.
- e. Copy Position: Centered
- 5. Total Thickness: 1/4 inch (____ mm) plus raised letter depth.
- 6. Sign Edges: Bevelled.
- 7. Letter Edges: Squared.
- 8. Corners: Radiused with square inner border.
- 9. Color and Font, unless otherwise indicated:
 - a. Character Font: Helvetica, Arial, or other sans serif font.
 - b. Character Case: Upper case only.
 - c. Background Color: If not scheduled on the drawings, then it shall be chosen by the Architect from the manufacturer's standard colors..
 - d. Character Color: If not scheduled on the drawings, then it shall be chosen by the Architect from the manufacturer's standard colors.
- 10. Material: Laminated colored plastic engraved through face to expose core as background color.
- 11. Material: High gloss acrylic plastic with letters and graphics sandblasted to dull sheen.
- 12. Profile: Flat panel in matching plastic frame.
- 13. Tactile Letters: Raised 1/32 inch minimum.
- 14. Braille: Grade II, ADA-compliant.
- 15. One-Sided Wall Mounting: Tape adhesive.

2.04 SIGNAGE APPLICATIONS

- A. Room and Door Sign:
 - 1. Locations as indicated on the door schedule and the standard mounting height drawings to meet ADA requirements.
 - 2. Instances where sign location falls where glass occurs; provide solid backer panel on back side.

2.05 ACCESSORIES

- A. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Notify Engineer/Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.
- C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until mm-dd-yyyy; repair or replace damaged items.

END OF SECTION

SECTION 102113.19
PLASTIC TOILET COMPARTMENTS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Solid plastic toilet compartments.
- B. Urinal screens.

1.02 REFERENCE STANDARDS

- A. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- B. B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- C. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings, locations drawings for bolt hole location attachments.
- C. Product Data: Provide data on panel construction, hardware, and accessories, cleaning and maintenance instructions.
- D. Samples: Submit two samples of partition panels, 3 x 3 inch (____by____ mm) in size illustrating panel finish, color, and sheen.
- E. Duplicate samples may be required. See section 016000 Product Requirements.
- F. Manufacturer's Installation Instructions: Indicate replacement parts information and replacement parts information.

1.04 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication.
- B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of components and related work. Coordinate delivery with other work to avoid delays.
- C. Building shall be enclosed and fully protected from outside weather prior to installation.
- D. Manufacturer Qualifications: Minimum 5years experience in manufacture of solid plastic shower and dressing compartments with products in satisfactory use under similar service conditions.
- E. Installer Qualifications: Minimum 5years experience in work of this Section.

1.05 WARRANTY

- A. Furnish 25 year warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship.
- B. Furnish 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Solid Plastic Toilet Compartments:
 - 1. Scranton Products (Santana/Comtec/Capital); Aria Series: www.scrantonproducts.com/#sle.
 - 2. Substitutions: Section 016000 - Product Requirements.

2.02 PLASTIC TOILET COMPARTMENTS

- A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), floor-to-ceiling. Waterproof and nonabsorbent, with self lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.

1. Series: Aria: Traditional 2000
2. Color: As chosen by architect from manufacturer's standard colors.
- B. Doors:
 1. Thickness: 1 inch (25 mm). with radiused edges
 2. Width: 24 inch (610 mm); in-swinging
 3. Width for Handicapped Use: 36 inch (915 mm), out-swinging.
 4. Height: 55 inch (1397 mm).
- C. Panels:
 1. Thickness: 1 inch (25 mm). with radiused edges
 2. Height: 55 inch (1397 mm).
- D. Pilasters:
 1. Thickness: 1 inch (25 mm).
 2. Width: As required to fit space; minimum 3 inch (76 mm).
- E. Urinal Screens: Without doors; to match compartments; mounted to wall with two panel brackets.
 1. Depth: 24"
 2. Provide vertical support/pilaster bracing and overhead bracing same as compartments.

2.03 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches (76 mm) high; concealing floor fastenings.
 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Extruded aluminum, anti-grip profile.
- C. Pilaster Brackets: Satin stainless steel.
- D. Wall Brackets: Continuous U-channel double ear type single piece 1/8" gauge extruded aluminum.
- E. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
 1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- F. Hinges: Stainless steel, manufacturer's standard finish.
 1. Continuous Helix hinges, gravity type, adjustable for door close positioning; stainless steel
- G. Door Hardware: Stainless steel, manufacturer's standard finish.
 1. Door Latch: Slide type with exterior emergency access feature.
 2. Provide door pull for outswinging doors.
- H. Coat Hook: Bobrick B76717 or equal. One per compartment, surface mounted on door.
- I. Hardware finish: Satin stainless steel
- J. Latch Side No Site Feature: Either ship lap door/panel construction or an applied no site stainless steel strip is acceptable.
- K. Wall stops: Cast Stainless Steel Wall Stop

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch (9 mm to 13 mm) space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

- A. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.04 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 102641
BALLISTICS RESISTANT PANELS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Laminated fiberglass ballistics-resistant panels.

1.02 RELATED REQUIREMENTS

- A. Section 092116 - Gypsum Board Assemblies: Metal framing to receive ballistics-resistant panels.
- B. Section 092216 - Non-Structural Metal Framing: Metal framing to receive ballistics-resistant panels.

1.03 REFERENCE STANDARDS

- A. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024.
- B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.
- C. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's current data sheets on each product to be used.
- C. Shop Drawings: Details of installation of ballistics-resistant panels, including plan views, elevations, sections, and details of the proposed installation with attachment methods.
- D. Warranty Documentation: Manufacturer warranty; ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name, manufacturer's identification, and required UL and NIJ certification labels until ready for installation.
- B. Handle material with care to prevent damage. Stack panels flat, store inside under cover off the ground in a dry location, and protect from other construction activities.

1.06 FIELD CONDITIONS

- A. Install products under environmental conditions (temperature, humidity, and ventilation) recommended by manufacturer.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 1 year manufacturer warranty for materials and workmanship against defects commencing on the Date of Substantial Completion.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Laminated Glass Fiber Ballistics-Resistant Panels:
 - 1. Total Security Solutions; _____: www.tssbulletproof.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 LAMINATED FIBER BALLISTICS-RESISTANT PANELS

- A. General:
 - 1. Laminated fiber ballistics-resistant panels to be non-ricochet type. When struck by a bullet or projectile, the panels to delaminate in such a way that absorbs the energy, stops the projectile, and prevents ricochet or spalling.
- B. Performance Requirements:
 - 1. Ballistics Resistance Rating: Listed and labeled as tested in accordance with UL 752 Level 8 (7.62 mm assault rifle) threat rating.
- C. Laminated Fiber Panels:

1. Material: Multiple layers of fiberglass woven roving bonded together with resin and compressed into flat rigid sheets.
2. Panel Size: Maximum size to limit number of seams.
3. Panel Thickness: Minimum thickness required for selected UL 752 threat level.
4. Panel Weight: Minimum weight required for selected UL 752 threat level.
5. Attachment Method: Mechanical fasteners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that substrates have been properly prepared.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation of this work.

3.03 INSTALLATION

- A. Install panels in accordance with manufacturer's instructions and shop drawings and in proper relationship with adjacent construction.
- B. Secure panels using screws, bolts, or industrial adhesive.

3.04 PROTECTION

- A. Protect installed panels from subsequent construction operations.

END OF SECTION

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Commercial toilet accessories.
- B. Provide Accessories for restrooms, janitor closets, toilet rooms, showers, utility rooms, and other accessory items as indicated on the Drawings and as specified herein..
 - 1. Refer to the Enlarged Restroom/Janitor Accessory Schedule on the Drawings.
 - 2. Contractor to coordinate all installs and provide blocking in wall as required for installation.
- C. Diaper changing stations.

1.02 RELATED REQUIREMENTS

- A. Section 093000 - Tiling
- B. Section 102113.19 - Plastic Toilet Compartments.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- C. ASTM C1036 - Standard Specification for Flat Glass; 2025.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.
- E. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.
- D. Manufacturer's Cleaning and Maintenance Instructions and replacement parts information.

1.05 QUALITY ASSURANCE

- A. Furnish and install inserts and anchoring devices that must be set in concrete or built into masonry; coordinate delivery with other work to avoid delays.
- B. Coordinate accessory location with other work to avoid interference and to assure proper operation and servicing of accessory units.
- C. Provide a single source manufacturer to the greatest extent possible for accessories.
- D. Manufacturer: Provide products manufactured by a company with a minimum of 10 years successful experience manufacturing similar products.
- E. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

1.07 WARRANTY

- A. Manufacturer's Warranty for Washroom Accessories: Manufacturer's standard 1 year warranty for materials and workmanship.

- B. Manufacturer's Warranty for Electric Hand Dryers: Manufacturer's standard 10 year warranty on parts, except 3 year warranty on motor brushes from Substantial Completion Date.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. ASI - American Specialties, Inc: www.americanspecialties.com.
 - 2. Bradley Corporation: www.bradleycorp.com.
 - 3. Bobrick Washroom Equipment, Inc.; www.bobrick.com
 - 4. Substitutions: Section 016000 - Product Requirements.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
- B. Keys: Provide 4 keys for each accessory to Owner.
- C. Stainless Steel Sheet: ASTM A666, Type 304, 22 gauge minimum thickness unless noted otherwise.
- D. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- E. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. Grab Bars:
 - 1. Provide 18-8 S, type 304, 18 gauge stainless steel tubing with satin finish. 1-1/2 inch outside diameter. Ends are heliarc welded to flanges.
 - 2. Clearance between grab bar and wall is 1-1/2 inch.
 - 3. Provide concealed mounting flanges: 18-8 S, type 304, 1/8 inch thick, stainless steel plate; end flanges 2 inches x 3-1/8 inch with two holes for attachment to wall. Intermediate flanges 2-5/8 inch x 3-1/8 inch diameter.
 - 4. Provide Snap Flange covers: 18-8S, type 304, 22 gauge drawn stainless steel with satin finish. 3-1/4 inch diameter x 1/2 inch deep. Each cover snaps over mounting flange to conceal mounting screws.
 - 5. Strength: support loads in excess of 250 pounds.
 - 6. Finish: Satin Finish
 - 7. Provide in locations as shown on Drawings.
 - 8. Products:
 - a. 36" Grab Bar, equal to Bobrick B-6806 or Bradley 812
 - b. 42" Grab Bar, equal to Bobrick B-6806 or Bradley 812
 - c. 18" Grab Bar, equal to Bobrick B-6806 or Bradley 812 (install vertical at ADA Toilet Stalls)
 - d. 24"x36" Shower Grab Bar, equal to Bobrick B-68616 (Provide at ADA Showers)
- B. Mirrors:
 - 1. One piece, 18-8, type 304 heavy gauge stainless steel angle frame, 3/4 inch x 3/4 inch with continuous integral stiffener on all sides and beveled front to hold frame tightly against mirror; corners shall be welded, ground and polished smooth. All exposed surfaces shall have satin finish with vertical grain. Galvanized steel backing with integral horizontal hanging brackets. Provide with concealed locking screws.
 - a. Manufacturers standard concealed mounting.
 - b. Provide with Tempered Glass Mirror.
 - c. Size: minimum of 18x36 unless larger is called for on the drawings.
 - 2. Provide in locations as shown on Drawings.

- 3. Finish: Satin Finish
- 4. Products:
 - a. Bradley Angle Frame Mirror Model 780.
 - b. Bobrick B-2908 Tempered Glass Welded-Frame Mirror
- C. Toilet Paper Dispenser: Owner Furnished Owner Installed.
- D. Paper Towel Dispenser: Owner Furnished Owner Installed.
- E. Soap Dispenser: Owner Furnished Owner Installed.
- F. Robe Hook: Surface mounted stainless steel robe hook with satin finish.
 - 1. 18-8, type 304, 22 gauge stainless steel flange and support arm with 18 gauge stainless steel concealed mounting bracket, 19 gauge stainless steel concealed wall plate, and 14 gauge stainless steel cap. All welded construction; secured to wall with a stainless steel setscrew.
 - 2. Finish: Satin Stainless Finish
 - 3. Mounting Style: Surface
 - 4. Products:
 - a. Bobrick B76717 Surface Mounted Robe Hook or equal
 - b. Substitutions: Section 016000 - Product Requirements.

2.05 SHOWER ACCESSORIES

- A. Shower Curtain Rod: 18-8, Type 304, 18 gauge Stainless steel tube, 1-1/4 inch (32 mm) outside diameter, 0.04 inch (1.0 mm) wall thickness, satin-finished, with 3 inch (75 mm) outside diameter, minimum 0.04 inch (1.0 mm) thick satin-finished stainless steel flanges, for installation with exposed fasteners.
- B. Finish: Satin Finish
- C. Mounting: Concealed Screws
 - 1. Products:
 - a. Bobrick B-6047 Extra-Heavy-Duty Shower Curtain Rod.
 - b. Bradley 9538 Stainless Steel Concealed Mount Shower Curtain Rod.
 - c. Substitutions: Section 016000 - Product Requirements.
 - 2. Length: As required per shower size - see drawings.
- D. Shower Curtain:
 - 1. Material: Opaque vinyl, 0.008 inch (0.2 mm) thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 - 2. Size:
 - a. Height: 72 inches
 - b. Length: Match shower width - see plans
 - 3. Grommets: Stainless steel; pierced through top hem on 6 inch (150 mm) centers.
 - 4. Color: White.
 - 5. Shower Curtain Hooks: Stainless steel spring wire designed for snap closure.
 - 6. Products:
 - a. Bobrick 204-2 Shower Curtain.
 - b. Bradley 9533 Antimicrobial Vinyl Shower Curtain.
 - c. Substitutions: Section 016000 - Product Requirements.
- E. In Shower ADA Transfer Bench: For Coordination purposes only. NIC. Wall mounted surface; Folding ADA Compliant seat.
 - 1. Seat: Solid Phenolic one-piece seat, 1/2 inch thick, solid phenolic with matte finish, standard ivory color. Integral slots for water drainage. Secured to frame with stainless steel carriage bolts and acorn nuts. Reversible for left or right hand installation in the field.
 - 2. Frame: 18-8, type-304, stainless steel with satin finish. 16-gauge(1.6mm), 1-1/4 inch (30mm) square tubing and 18-gauge (1.2mm), 1 inch (25mm) diameter seamless tubing.
 - 3. Mounting Flanges: Two (2) 18-8, type 304, 3/16 inch (5mm) thick stainless steel with satin finish. 3 inch (75mm) diameter with three mounting screw holes.
 - 4. Baseplate: 18-8, type 304 heavy gauge stainless steel.

5. Spring: 17-7, type 301, 24 gauge (0.6 mm) stainless steel. Spot welded to baseplate.
6. Guide Bracket: 18-8, type 304, 16 gauge (1.6mm) stainless steel with satin finish.
7. Products:
 - a. Bobrick B5181 Reversible Solid Phenolic Folding Shower Seat
 - b. Bradley 9569 Reversible Phenolic Shower Seat.
 - c. Substitutions: Section 016000-Product Requirements.
- F. Wall-Mounted Soap Dish: Heavy duty, seamless stainless steel, surface-mounted with drain holes, without grab bar, satin finish; with concealed mechanical fastening suitable for substrate and backplate.
 1. Products:
 - a. Bradley 9014 Surface-Mounted Stainless Steel Soap Dish.
 - b. Substitutions: Section 016000 - Product Requirements.
- G. Towel Bar: Stainless steel, 3/4 inch (20 mm) square tubular bar; rectangular brackets, concealed attachment, satin finish.
 1. Length: 30 inches (760 mm).

2.06 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 1. Material: Stainless steel.
 2. Mounting: Recessed.
 3. Finish: Satin Finish
 4. Minimum Rated Load: 250 pounds (113.4 kg).
 5. Stainless Steel Bag Hook: Provide one (1) matching bag hook mounted within 24" of the each changing station @ 48" above the finish floor.
 6. Products:
 - a. Bobrick (Koala Kare) KB310-SSWM Horizontal Stainless Steel Surface-Mounted.
 - b. Bradley 962-11 Baby Changing Station, Recessed-Mounted, Stainless Steel.

2.07 JANITOR ROOM ACCESSORIES

- A. Combination Utility Shelf/Mop and Broom Holder:
 1. Utility shelf with mop/broom holders and rag hooks shall be type 304 stainless steel with all welded construction; exposed surfaces shall have satin finish. Shelf shall be 18 gauge, 8 inch deep with 3/4 inch return edges, and shall have front edge hemmed for safety. Mop/broom holders shall be spring loaded rubber cams with anti-slip coating.
 2. Products:
 - a. Equal to Bobrick B239x34 or Bradley 9933 BradEx.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Examine substrates, any previously installed inserts or anchorages.
- D. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- E. Verify that field measurements are as indicated on drawings.
- F. Do not proceed with work until conditions are acceptable for installation.

3.02 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: Provide as indicated on Drawings and as required to meet accessibility regulations, unless otherwise indicated.

- D. Install utilizing fasteners which are appropriate to substrate and recommended by Manufacturer for unit.
- E. Adjust toilet accessories for proper operation and verify that all mechanisms function smoothly.

3.03 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 104400
FIRE PROTECTION SPECIALTIES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Building Master Key Security Box
- B. Fire extinguishers.
 - 1. Provide fully charged portable fire extinguisher where noted on drawings. Provide the following types:
 - a. Semi-Recessed Cabinet and Extinguisher mounted noted on drawings as (FEC)
 - 1) These are to be installed in new walls that have the FEC designation.
 - b. Surface mounted Cabinet and Extinguisher noted on drawings as (FEC)
 - 1) These are to be installed on existing walls that have the FEC designation.
 - c. Bracket Mounted Extinguisher noted on drawings as (FE)
- C. Fire extinguisher cabinets.
- D. Accessories.

1.02 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide; Current Edition.
- B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.
- C. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Fire Extinguishers:
 - 1. J.L. Industries, Inc.: www.jlindustries.com.
 - 2. Larsens Manufacturing Company: www.larsensmfg.com.
 - 3. Or Equal
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Fire Extinguisher Cabinets (FEC) and Accessories:
 - 1. J.L. Industries, Inc.: www.jlindustries.com
 - 2. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
 - 3. Or Equal.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- C. Building Master Key Lock Box
 - 1. Knox: www.knoxbox.com
 - 2. Or Equal
 - 3. Substitutions: See Section 016000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
 - 2. Provide fire extinguishers, cabinets, and accessories from a single manufacturer.

- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Stored Pressure Operated: Deep Drawn.
 - 2. Class: A:B:C type.
 - 3. Size: 10 pound (4.54 kg).
 - 4. Finish: Baked polyester powder coat, red color.
 - 5. Temperature range: Minus 65 degrees F (Minus 54 degrees C) to 120 degrees F (___ degrees C).
- C. Wet Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
 - 1. Class: K type.
 - 2. Temperature range: Minus 20 degrees F (Minus 29 degrees C) to 120 degrees F (49 degrees C).

2.03 FIRE EXTINGUISHER CABINETS

- A. Cabinet Configuration: Semi-recessed type for 6" metal stud, 2x6 wood stud, or 8" CMU walls.
 - 1. Steel; sized to accommodate fire extinguisher as specified.
 - a. Non Fire Rated Walls: Equal to J.L. Industries Academy Aluminum Series, Model 1027
 - b. Fire Rated Walls: Equal to J.L. Industries Academy Aluminum Fire-FX2 Fire Rated Extinguisher Cabinets, Model 1027
 - c. Cabinet Requirements
 - 1) Cabinet Door Style: Vertical Duo with recessed pull and Saf-T-Lok with a 5/8" stop attached by a continuous hinge.
 - 2) Cabinet Door Glazing: Laminated Safety Glass
 - 3) Cabinet Trim Style and Depth: Semi-recessed with 3 inch rolled edge.
 - 4) Cabinet Door & Trim Construction: Aluminum with 180 clear anodized finish.
 - 5) 3/4 inch wide trim on frame and 1-1/4 inch trim on doors with glazing.
 - 6) Tub: Aluminum with 180 clear anodized finish.
 - 7) Decal: 2"x19" vertical red/clear Fire Extinguisher #LDVRF.
- B. Cabinet Configuration: Semi-recessed type for 3-5/8" metal stud or 2x4 wood stud walls.
 - 1. The following cabinet size shall be verified by the contractor and adjusted as necessary to accommodate fire extinguisher as specified.
 - a. Non Fire Rated Walls: Equal to J.L. Industries Academy Aluminum Fire Extinguisher Cabinets, Model 1022
 - b. Fire Rated Walls: Equal to J.L. Industries Academy Aluminum Fire-FX2 Fire Rated Extinguisher Cabinets, Model 1022
 - c. Cabinet Requirements:
 - 1) Cabinet Door Style: Vertical Duo with recessed pull and Saf-T-Lok with a 5/8" stop attached by a continuous hinge.
 - 2) Cabinet Door Glazing: Laminated Safety Glass
 - 3) Cabinet Trim Style and Depth: Semi-recessed with 4 inch rolled edge.
 - 4) Cabinet Door & Trim Construction: Aluminum with 180 clear anodized finish.
 - 5) 3/4 inch wide trim on frame and 1-1/4 inch trim on doors with glazing.
 - 6) Tub: Aluminum with 180 clear anodized finish.
 - 7) Decal: 2"x19" vertical red/clear Fire Extinguisher #LDVRF.
- C. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

2.04 BUILDING MASTER KEY LOCK BOX

- A. Manufacturer: Equal to Knox
- B. Basis of Design Product: KnoxBox 3200 Series Standard Capacity
- C. Model: #3275 Recessed Mount
- D. Size:
 - 1. Box Body: 4"Hx5"Wx3-7/8"D
 - 2. Recessed Mounting Flange: 7"Hx7"W
- E. Capacity: Will hold up to 10 keys, access cards, or entry items
- F. Color: To be chosen by Architect from Manufacturer's standard color options.

- G. Mounting: Recess Mount Model Number #3275
- H. Location: To be determined during construction. Coordinate with Architect prior to installation.

2.05 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, galvanized and enamel finished. Provide bracket as applicable for the specified fire extinguishers in locations as indicated on Drawings.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings at height indicated on drawings; fully comply to ADA requirements and local jurisdiction for mounting heights. For the surface mounted cabinets that protrude more than 4 inches into a space, the mounting height must be mounted so that the bottom of the cabinet is no more than 27 inches off the finish floor. Do not mount them lower than 26" off the finish floor.
- C. Prepare recesses in walls for fire extinguisher cabinets as required for size, type, and style of trim specified.
- D. Secure cabinets and bracket mounted extinguishers rigidly in place.
- E. Provide and install brackets for the extinguishers that are inside a FEC.
- F. Provide and verify servicing, charging and tagging of all fire extinguishers.
- G. Place extinguishers and accessories in cabinets.

END OF SECTION

SECTION 105129
PHENOLIC LOCKERS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Phenolic lockers.
- B. Locker benches.

1.02 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Phenolic Lockers:
 - 1. Summit Lockers, Inc; Phenolic Lockers: www.summitlockers.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 LOCKER APPLICATIONS

- A. Employee Lockers: Phenolic lockers, wall mounted with matching closed base.
 - 1. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 2. Width: 12 inches (305 mm).
 - 3. Depth: 15 inches (381 mm).
 - 4. Height: 72 inches (1830 mm).
 - 5. Locker Configuration: Two tier.
 - 6. Fittings: Size and configuration as indicated on drawings.
 - a. Hat shelf.
 - b. Hooks: One single prong.
 - 7. Ventilation: By open space between the back of the door and locker body.
 - 8. Locking: Padlock hasps, for padlocks provided by Owner.
- B. Locker Benches: Stationary type; bench top of phenolic material; painted steel pedestals.
 - 1. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 2. Height: 17-19 inch (____ mm).
 - 3. Length: 42 min inch (____ mm).
 - 4. Depth: 20-24 inch.
 - 5. Manufacturers:
 - a. Summit Lockers, Inc; ADA Benches: www.summitlockers.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- C. Locker Bench Support Brackets: Welded structural aluminum single arm floor mount pedestal bench support brackets; pre-drilled for bench top material attachment and for wall anchorage.
 - 1. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 2. Products:
 - a. Summit Lockers, Inc; Powder Coated Aluminum.

2.03 PHENOLIC LOCKERS

- A. Lockers: Factory assembled, made of phenolic core panels with mortise and tenon joints and stainless steel mechanical joint fasteners; fully finished inside and out; each locker capable of standing alone.
 - 1. Doors: Full overlay, covering full width and height of locker body; square edges.
 - 2. Panel Core Exposed at Edges: Machine polished, without chips or tool marks; square edge unless otherwise indicated.
 - 3. Where locker ends or sides are exposed, finish the same as fronts or provide extra panels to match fronts.
 - 4. Door Color: As selected by Engineer/Architect; allow for 2 different colors.
 - 5. Body Color: Manufacturer's standard white or light color.
 - 6. Fasteners for Accessories and Locking Mechanisms: Tamperproof type.
- B. Component Thicknesses:
 - 1. Doors: 1/2 inch (13 mm) minimum thickness.
 - 2. Locker Body: One of the following combinations:
 - a. Tops, bottoms, and shelves 1/2 inch (13 mm); sides 3/8 inch (10 mm); backs 1/4 inch (6 mm); minimum.
 - 3. End Panels and Filler Panels: 1/2 inch (13 mm) minimum thickness.
 - 4. Sloped Tops: 1/2 inch (13 mm) minimum thickness.
 - 5. Toe Kick Plates: 1/2 inch (13 mm) minimum thickness.
- C. Phenolic Core Panels: Nonporous phenolic resin and paper core formed under high pressure, with natural colored finished edges, integral melamine surface, matte finish, and uniform surface appearance; glued laminated panels not acceptable.
 - 1. Surface Burning Characteristics: Flame spread index of 75 or less, and smoke developed index of 450 or less; when tested in accordance with ASTM E84.
- D. Hinges: Stainless steel, satin finish; minimum of 180 degree opening; either exposed barrel 5-knuckle hinge attached to back of door and inside of body with tamperproof screws, or concealed cabinetwork style hinge attached with tamperproof screws.
- E. Coat Hooks: Stainless steel or reinforced nylon; attached with tamperproof screws.
- F. Number Plates: Manufacturer's standard, minimum 4-digit, permanently attached with adhesive; may be field installed.
- G. Lock Strike: Stainless steel, or black high impact ABS plastic strike plate attached to locker body with throughbolts.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.
- B. Verify bases and embedded anchors are properly sized.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.
- C. Install lockers plumb and square.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds (445 N).
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, and sloped tops.
- G. Install accessories.
- H. Replace components that do not operate smoothly.

3.03 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION

**SECTION 107313
AWNINGS****PART 1 GENERAL****1.01 SECTION INCLUDES****1.02 REFERENCE STANDARDS**

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- D. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2022.
- E. ASTM B483/B483M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Tube and Drawn Pipe for General Purpose Applications; 2021.

1.03 DESIGN REQUIREMENTS

- A. Awning materials, assembly and attachments shall be designed to resist snow loads, positive and negative wind design loads as indicated on the structural drawings at any point without damage or permanent set.
- B. Design Load: 20 lbs per sq. ft.
- C. Roof decking must withstand concentrated walking load of 200 lbs.
- D. Maximum Deflection Limit: L/120 of span.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate awning profiles, sizes, connection attachments, anchorage, size and type of fasteners, accessories. Provide sections and details at connections.
- C. Selection Samples: Manufacturer's color charts for metal framing and awning panel colors and finishes.
- D. Verification Samples: Two samples, minimum size 2 by 3 inches (50 by 75 mm), representing actual material and finish of exposed metal.
- E. Duplicate samples may be required. See section 016000 Product Requirements.
- F. Manufacturer's qualification statement.
- G. Executed warranty.
- H. Specimen warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least 5 years of experience in similar work.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Installer Warranty: Provide 1 warranty for defective installation commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with installer.
- C. Finish Warranty: Provide 10-year manufacturer warranty against excessive degradation of factory-applied finishes. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire resistance ratings for awning covering.

1.08 QUALITY ASSURANCE:

- A. General: Provide awning units, which are complete assemblies, produced by one manufacturer/fabricator.
- B. All structural framework elements are single source responsibility of fabricator.
- C. Fabricator's Qualifications: Where indicated units require custom fabrication, provide units fabricated by shop which is skilled, and with a minimum of five (5) years of experience in similar work. Where units cannot be fully shop-fabricated, complete fabrication work at project site.

1.09 WARRANTY

- A. Exposed roof panel finish shall be warranted by the panel manufacturer for a minimum of 20 years. Labor to replace defective roof panel shall be warranted for 1 year. Aluminum frame shall be warranted for 10 years. Installation shall be warranted against defective material and workmanship for a period of 1 year by awning manufacturer.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Basis of Design: Mapes Architectural Canopies: www.mapescanopies.com, 7748 North 56th Street, Lincoln, NE 68514. Phone (888) 273-1132. Fax (877) 455-6572.
- B. Pre-Approved Equal
- C. Substitutions: See Section 016000 - Product Requirements.

2.02 AWNINGS - GENERAL

- A. Configuration: As indicated on drawings.
- B. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

2.03 PRODUCT

- A. Basis of Design: Mapes Canopies, Suspended Metal Canopy with Hangers.
 - 1. Decking: Fabricated from 0.032 inch thick aluminum
 - a. Roll formed squared deck, 2 3/4 inch deep section.
 - 2. Fascia/gutter: Fabricated from 0.125 inch thick aluminum.
 - a. 4 inch wide extruded with offset
 - 1) 8 inch tall
 - 3. Brackets: 6" diamond
 - 4. Hangers: Fabricated from 0.125 inch thick aluminum
 - a. 1.5 inch square tube
 - b. Finish: Finish color to match awning
 - 5. Beams: Extruded "I" beams or "C" beams and "U" (drain) beams of sufficient depths to adequately support imposed loads.

2.04 MATERIALS

- A. Smooth aluminum:
 - 1. Extrusions: Meeting requirements of ASTM B221, alloy 6061-T6, 6063-T5, or 6063-T6.
- B. Anchorage Devices, Clips and Fasteners: Manufacturer's standard type, compatible with materials being secured, of size and spacing sufficient to resist indicated loads. Above roof deck, utilize fasteners with neoprene washers.
- C. Sealants: Single component silicone, in color to match sheets and extrusions.
- D. Accessories: Flashings, brackets, drainage scupper/tail spout and other items as necessary for complete system.

2.05 FABRICATION - FRAMING

- A. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

- B. Awning Framework: Use materials of size and thickness as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings. Use type of materials indicated or specified for various components of work.
 - 1. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Maintain cross-section tubing. Crimped ends, fitting and tee connections are not acceptable.
 - 2. Junctions bearing major stress shall receive no less than 3 welds per joint.
 - 3. Welding process to be mig wire welded with argon gas and 4043 alloy aluminum welding wire.
 - 4. Rafter spacing shall be no more than 60" on center.
 - 5. Drop and projection arms shall be no more than 72" on center.
- C. Fit and shop assemble components in largest practical sizes, for delivery to site.
- D. Fabricate components with joints tightly fitted and secured.
- E. Exposed Fastenings: Unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of framing. Fabricate anchors and related components of same material and finish as framing, except where specifically noted otherwise.
- G. Accurately form components to suit each other and to building structure.

2.06 FINISHES

- A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
- B. Finish Color: As selected by Engineer/Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall substrate anchors are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be placed in partitions with setting templates, to appropriate Sections.

3.03 INSTALLATION - FRAMING

- A. General: Install awning units in manner indicated to comply with manufacturer's instructions. Position units level, plumb, secure at proper height and location relative to adjoining window units, openings and other related work. Secure anchor units with proper clips, brackets, and anchorages, suited to type of mounting indicated.
- B. Install in accordance with manufacturer's instructions.
- C. Install components plumb and level, accurately fitted, free from distortion or defects.
- D. Provide anchors required for connecting framing to structure. Anchor framing to structure.
- E. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 INSTALLATION - METAL COVERING

- A. Install in accordance with manufacturer's instructions.
- B. Fasten metal covering panels to metal support members, aligned level and plumb.
- C. Install fascia panels, trim, and flashing.
- D. Separate dissimilar metals using concealed bituminous paint.
- E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.05 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Misalignment From True Position: 1/4 inch (6 mm).

END OF SECTION

**SECTION 107316.13
METAL CANOPIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Attached metal canopies.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete footings.

1.03 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- D. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2025.
- E. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2024.
- F. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.
- C. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing profiles, sections of components, finishes, and fastening details.
- D. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE**1.06 WARRANTY**

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Metal Canopies: Correct defective work within a two year period after Date of Substantial Completion.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Metal Canopies:
 - 1. Mapes Industries; Super Lumideck: <https://mapes.com/#sle>.

2.02 METAL CANOPIES

- A. Shop Fabricated Steel Canopy
- B. Configuration: Layout and dimensions, column layout, canopy clearance, fascia profile, and roof covering design as indicated on drawings.
 - 1. Installation: Face-mounted to building structure.
 - 2. Structural Framing System: Steel.
 - 3. Covering Material: Steel.

4. Drainage Concept: Water collected in decking conducted into perimeter drain beams and discharged through downspouts.
- C. Performance Requirements:
 1. Design and fabricate metal canopy system to resist wind, snow, live, and seismic loads without failure, damage, or permanent deflection in accordance with ASCE 7:
 2. Thermal Movement: Design canopy system to accommodate thermal movement caused by ambient temperature range of 120 degrees F (49 degrees C) and surface temperature range of 180 degrees F (82 degrees C) without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects on assembly components.

2.03 COMPONENTS

- A. Structural Steel Framing:
 1. Base and Top Plates: ASTM A36/A36M, with pre-drilled bolt holes.
 2. Beams: Wide flange, ASTM A572/A572M Grade 50.
 3. Other Structural Steel Members: ASTM A36/A36M.
- B. Covering:
 1. Steel Decking: Interlocking panels.
 - a. Panel Size: 16 inches wide by 3 inches deep (406 mm wide by 76 mm deep); 20 gauge, 0.0359 inch (0.91 mm) thickness.
 - b. Provide canopy manufacturer's standard clip type fasteners for attaching covering to structural beams.
- C. Fascia: Same material as structural framework, ___ inches (___ mm) high.
- D. Anchor Bolts: ASTM A307 or ASTM A572/A572M, formed with bent shank, assembled with template for casting into concrete.
 1. Minimum exposed thread of 7 inches (178 mm) above footing and 23 inch (584 mm) minimum embedment.
 2. Provide nuts and washers as required for column leveling and plumbing.
- E. Concrete Footings: Refer to Section 033000 for additional requirements.

2.04 FINISHES

- A. Structural Steel Framing:
 1. Shop Primer: Rust-inhibitive red oxide.
- B. Steel Decking and Roofing: Polyester baked enamel finish; color as selected from manufacturer's standard range.

2.05 ACCESSORIES

- A. Structural Bolts: ASTM F3125/F3125M, Grade A325, minimum 3/4 inch (19 mm) diameter.
- B. Trim, Closure Pieces, and Flashings: Same material, thickness and finish as sheet metal decking; factory-fabricated to required profiles.
 1. Exposed Fasteners: Not permitted.
- C. Fasteners, Non-Structural: ASTM F593 stainless steel or ASTM A307 carbon steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and site area for conditions that might prevent satisfactory installation.
- B. Verify that foundation, electrical utilities, and placed anchors are in correct position.
- C. Do not proceed with installation until all conditions are satisfactory.

3.02 INSTALLATION - FRAMING

- A. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation.
- B. Set column base plates with non-shrink grout to achieve full plate bearing.

- C. Fasten columns to anchor bolts.
- D. Do not field cut or alter structural members without approval.
- E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 INSTALLATION - CANOPY COVERING

- A. Install in accordance with manufacturer's instructions.
- B. Fasten metal decking to metal support members, aligned level and plumb.
- C. Install fascia panels, trim, and flashing.
- D. Separate dissimilar metals using concealed bituminous paint.
- E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.04 TOLERANCES

- A. Maximum Variation from Level: Plus/Minus 1/8 inch (3.175 mm).

3.05 CLEANING

- A. Clean surfaces of dust and debris; follow manufacturer's cleaning instructions for the finish used.

END OF SECTION

SECTION 107316.13
METAL CANOPIES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Attached metal canopies.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete footings.

1.03 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- D. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2025.
- E. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2024.
- F. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.
- C. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing profiles, sections of components, finishes, and fastening details.
- D. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE**1.06 WARRANTY**

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Metal Canopies: Correct defective work within a two year period after Date of Substantial Completion.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Metal Canopies:
 - 1. Mapes Industries; Super Lumideck: <https://mapes.com/#sle>.

2.02 METAL CANOPIES

- A. Shop Fabricated Steel Canopy
- B. Configuration: Layout and dimensions, column layout, canopy clearance, fascia profile, and roof covering design as indicated on drawings.
 - 1. Installation: Face-mounted to building structure.
 - 2. Structural Framing System: Steel.
 - 3. Covering Material: Steel.

4. Drainage Concept: Water collected in decking conducted into perimeter drain beams and discharged through downspouts.
- C. Performance Requirements:
 1. Design and fabricate metal canopy system to resist wind, snow, live, and seismic loads without failure, damage, or permanent deflection in accordance with ASCE 7:
 2. Thermal Movement: Design canopy system to accommodate thermal movement caused by ambient temperature range of 120 degrees F (49 degrees C) and surface temperature range of 180 degrees F (82 degrees C) without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects on assembly components.

2.03 COMPONENTS

- A. Structural Steel Framing:
 1. Base and Top Plates: ASTM A36/A36M, with pre-drilled bolt holes.
 2. Beams: Wide flange, ASTM A572/A572M Grade 50.
 3. Other Structural Steel Members: ASTM A36/A36M.
- B. Covering:
 1. Steel Decking: Interlocking panels.
 - a. Panel Size: 16 inches wide by 3 inches deep (406 mm wide by 76 mm deep); 20 gauge, 0.0359 inch (0.91 mm) thickness.
 - b. Provide canopy manufacturer's standard clip type fasteners for attaching covering to structural beams.
- C. Fascia: Same material as structural framework, ___ inches (___ mm) high.
- D. Anchor Bolts: ASTM A307 or ASTM A572/A572M, formed with bent shank, assembled with template for casting into concrete.
 1. Minimum exposed thread of 7 inches (178 mm) above footing and 23 inch (584 mm) minimum embedment.
 2. Provide nuts and washers as required for column leveling and plumbing.
- E. Concrete Footings: Refer to Section 033000 for additional requirements.

2.04 FINISHES

- A. Structural Steel Framing:
 1. Shop Primer: Rust-inhibitive red oxide.
- B. Steel Decking and Roofing: Polyester baked enamel finish; color as selected from manufacturer's standard range.

2.05 ACCESSORIES

- A. Structural Bolts: ASTM F3125/F3125M, Grade A325, minimum 3/4 inch (19 mm) diameter.
- B. Trim, Closure Pieces, and Flashings: Same material, thickness and finish as sheet metal decking; factory-fabricated to required profiles.
 1. Exposed Fasteners: Not permitted.
- C. Fasteners, Non-Structural: ASTM F593 stainless steel or ASTM A307 carbon steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and site area for conditions that might prevent satisfactory installation.
- B. Verify that foundation, electrical utilities, and placed anchors are in correct position.
- C. Do not proceed with installation until all conditions are satisfactory.

3.02 INSTALLATION - FRAMING

- A. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation.
- B. Set column base plates with non-shrink grout to achieve full plate bearing.

- C. Fasten columns to anchor bolts.
- D. Do not field cut or alter structural members without approval.
- E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 INSTALLATION - CANOPY COVERING

- A. Install in accordance with manufacturer's instructions.
- B. Fasten metal decking to metal support members, aligned level and plumb.
- C. Install fascia panels, trim, and flashing.
- D. Separate dissimilar metals using concealed bituminous paint.
- E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.04 TOLERANCES

- A. Maximum Variation from Level: Plus/Minus 1/8 inch (3.175 mm).

3.05 CLEANING

- A. Clean surfaces of dust and debris; follow manufacturer's cleaning instructions for the finish used.

END OF SECTION

**SECTION 107500
FLAGPOLES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Aluminum Flagpoles.

1.02 REFERENCE STANDARDS

- A. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2022.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pole, accessories, and configurations.
- C. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed the State in which the Project is located.
- B. Design Criteria: Flagpole shall be designed to withstand wind velocity for the project region and as outlined on the Structural Drawings. Use heavy pipe sizes if required for flagpole type and height.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.
- B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Flagpoles:
 - 1. American Flagpole: www.americanflagpole.com.
 - 2. Concord Industries, Inc: www.concordindustries.com.
 - 3. Pole-Tech Co., Inc: www.poletech.com.
 - 4. Substitutions: See Section 016000 - Product Requirements.

2.02 FLAGPOLES

- A. Flagpoles: Aluminum, Alloy 6063-T6 Tapered Tube
 - 1. Mounting: Ground mounted type.
 - 2. Outside Butt Diameter: 6 inches (____ mm).
 - 3. Outside Top Diameter: 3.5 inches (____ mm).
 - 4. Nominal Wall Thickness: 0.250 inches (____ mm).
 - 5. Nominal Height: 30 ft (____ m); measured from nominal ground elevation.
- B. Performance Requirements:
 - 1. Flagpole Without Flag: Resistant without permanent deformation to 140 miles/hr (____ km/hr) wind velocity; non-resonant, safety design factor of 2.5.

2.03 POLE MATERIALS

- A. Aluminum: ASTM B241/B241M , 6063 alloy , T6 temper.

2.04 ACCESSORIES

- A. Finial Ball: Aluminum, 6 inch (150 mm) diameter.
- B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.
- C. Cleats: 9 inch (230 mm) size, aluminum with stainless steel fastenings, two per halyard.
- D. Halyard: 5/16 inch (8 mm) diameter nylon, braided, white.

2.05 MOUNTING COMPONENTS

- A. Foundation Tube Sleeve: AASHTO M 36M, corrugated 16 gage, 0.0598 inch (1.52 mm) steel, galvanized, depth of 36 inches (____ mm) as indicated or as required for design wind velocity.
- B. Pole Base Attachment: Sleeve; steel base with base cover; 2" cap with hardwood wedges, 16 gauge galvanized steel tube ground sleeve with steel plate welded to sleeve and steel support plate.
- C. Lighting Ground Rod: 18 inch (____ mm) long copper rod, 3/4 inch (19 mm) diameter.

2.06 FINISHING

- A. Metal Surfaces in Contact With Concrete: Asphaltic paint.
- B. Concealed Steel Surfaces: Prime painted.
- C. Aluminum: Mill finish.
- D. Final: Gold anodized finish.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

- A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

- A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.
- B. Install welded base assembly for flagpoles base set in concrete base and fasten.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1 inch (25 mm).

3.05 ADJUSTING

- A. Adjust operating devices so that halyard function smoothly.

END OF SECTION

SECTION 111900
DETENTION EQUIPMENT**PART 1 GENERAL****1.01 SCOPE OF WORK**

Section 111900 Detention Equipment

Section 111910 Security Hollow Metal Doors, Frames and Windows

Section 111920 Security Hardware

Section 111930 Security Glazing

Section 111940 Security Furnishings

Section 111950 Medium Security Metal Ceilings

Section 111960 Maximum Security Metal Ceiling

Section 111980 Protective Cell Padding System

Division 280000 Security Electronics System

- A. Products supplied but not installed under this section.
 - 1. Embedded Items
 - 2. Security Hollow Metal Frames
- B. All materials and labor specified under 1.01 Scope of Work, Paragraph A, of the Specifications shall be furnished by a single qualified DSC who shall assume responsibility for the detailing, coordinating, supplying, erecting (where applicable), performance and warranty of this work, in accordance with this specification section.
- C. Work By Others
 - 1. Installation of conduit and wiring systems by electrical contractor, Division 16.

1.02 DEFINITIONS

- A. DSC - Detention System Contractor

1.03 SUBMITTALS: IN COMPLIANCE WITH DIVISION 1, SECTION 01300.**1.04 LICENSE AND CERTIFICATIONS**

- A. Any DSC firm who intends to submit a bid on this Section of the Specifications shall submit the following qualification evidence:
 - 1. Louisiana State Contractors License
 - 2. Louisiana State Life Safety and Property Protection License
 - 3. Manufacturer Certification

1.05 QUALITY ASSURANCE:

- A. Qualifications of Detention System Contractor: Any DSC firm who intends to submit a bid on this Section of the Specifications shall submit the following qualification data to the Architect in writing fourteen (14) days prior to bid date and, if approved, acknowledgment shall be by Addendum prior to bid date. Verbal approval will not satisfy this requirement. All DSCs except those listed below shall submit all information exactly as herein requested or will not be allowed to submit a bid. Grounds for disqualification shall exist if it is proven that the information submitted is inaccurate or, in the opinion of the Architect, does not satisfy the qualification requirements.
 - 1. Evidence is that the DSC firm has a minimum of ten (10) years experience in successfully completing projects of equal scope and magnitude with products as herein specified. This evidence shall consist of a list of ten (10) projects that have been completed and operational for a minimum of five (5) years.
 - 2. For each facility, list: name and location of installation, date of occupancy by Owner, Owner's representative to contact and telephone number, Construction Manager or General Contractor, and Architect.
 - 3. Provide independently audited financial statement for the previous year.

4. Provide statement indicating DSC has not filed for bankruptcy protection within the past ten (10) years.
 5. Submit to the Owner a letter from the lock manufacturer stating that this firm is a factory-trained, fully authorized installer of their complete line of product.
 6. Submit a statement letter from the Surety Company (that has an AM best "A15" rating) stating that a 100% Payment and Performance bond will be supplied if selected as the successful Detention System Contractor (DSC).
 7. Any firm intending to submit a proposal for this work must examine the existing conditions and equipment. Evidence of compliance with this requirement must be submitted along with the proposal. This evidence consists of a signature of a qualified representative of the Owner attesting to the date and time of the inspection.
 8. Any supplier accepted under this provision shall be added by addendum prior to bid. Bids received from others not named herein nor accepted by addendum will be unresponsive and will not be accepted.
- B. All DSCs including those listed below, shall submit a bid bond for the full amount of their bid to the General Contractor at or prior to bid time or supply evidence of such bond ability from surety company.
- C. Cornerstone Detention Products, Tanner, AL
Securtec, Incorporated, Baton Rouge, LA
Maximum Security Products, Waterford, NY

NOTE: Approval of a firm as a DSC does not relieve that DSC from furnishing all materials from the manufacturers as herein specified.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Responsibility of the General Contractor: (At no additional cost to the DSC):
1. Receive from carrier, unload, and store all material which is furnished only by the DSC and installed by others.
 2. Temporary access openings required through walls to permit the placing of the detention equipment in the areas of the building where it is to be installed and provide use of hoist, cranes, elevators, and lifts and/or cranes on regular time with qualified operators.
 3. Protect all materials during storage on the job and after installation. All protection required while working and/or cleaning adjacent materials shall be the responsibility of the General Contractor.
 4. Provide an adequate, secure, dry, lockable storage area or room for all materials specified in this Section.
- B. The DSC shall be responsible for receiving, unloading and distribution of all products furnished and installed by the DSC.

1.07 WARRANTY

- A. The DSC warrants materials furnished and installed under this Section to be free from defects in materials and workmanship for a period of one (1) year after installation. Material which has been misused, abused, or neglected by the Owner, defects for damage caused by work or failure of work by others; ordinary wear and tear; or normal equipment adjustment which are within the Owner's operation and maintenance responsibility will not be covered by the warranty.
- B. Any unauthorized modifications, repairs or tampering shall constitute termination of this warranty.
- C. The DSC shall be fully reimbursed including travel expenses for service calls during the warranty period which prove to be other than work covered by the DSCs warranty.
- D.

PART 2 PRODUCTS

2.01 MANUFACTURER:

- A. The DSC shall utilize only listed approved manufacturers, component fabricators and suppliers. Any other manufacturers, component fabricators or suppliers must be approved by addenda twenty-one (21) days prior to bid date.

2.02 INTEGRATION:

- A. The DSC shall be responsible for the integration, interfacing and coordination of all products and systems with other related parties as hereinafter defined and specified.

PART 3 EXECUTION**3.01 PREPARATION**

- A. Examine the areas and conditions under which installation is to occur and document conditions detrimental to the proper and timely completion of the work. Installation should not proceed until unsatisfactory conditions have been corrected.
- B. Prior to installation, meet at project site for purpose of reviewing products and installation methods selected, procedures to be followed in performing the work and coordination.
- C. Protect adjacent surfaces while installing products against damage, stains.
- D. Ascertain location and arrangement of anchorage required to accommodate work; coordinate with other trades where necessary to make provisions for installation.
- E. Furnish drawings, diagrams, templates, instructions, and directions for installation of all products. Coordinate delivery of such products to project site.
- F. Distribute all items to installation locations immediately prior to installation, complying with all applicable product handling requirements. Coordinate timing of distribution.
- G. Coordinate with other trades for proper location of rough-in services and service connections specified elsewhere.

3.02 INSTALLATION

- A. Securely place products in locations required. Install in alignment, free from warp, twist, or distortion, plumb, level, and true. Comply with approved shop drawings, manufacturer's instructions, and recommendations for both handling and installation of the products for conditions of installation in each case, except where more stringent requirements are indicated or specified, or where project conditions require extra precautions or provisions for satisfactory performance of work. Where printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding. Do not install products which are observed to be defective.
- B. Perform cutting, drilling, and fitting required for installation of detention equipment.
- C. Set work accurately in location, alignment, and elevation, measured from established lines and levels with lines visually parallel.
- D. Cut necessary holes for installation or other work in detention equipment; comply with templates or detail drawings furnished by other trades prior to fabrication and installation of detention work.
- E. Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work. Exposed plug welds shall be 1/8 inch minimum at 3/8-inch diameter holes equally and uniformly spaced over each frame, evenly spaced not greater than 12 inches on center. Exposed fillet (stitch) welds shall be 1/8 inch minimum, 1-1/2 inches long (minimum length) evenly spaced not greater than 12 inches on center. Exposed welds that occur at frame corners and at door frames shall start no further than 4 inches above sills. Where surfaces are to be exposed to view, grind, and sand weld smooth; finish holes, defects, other imperfections so surfaces will be smooth when painted.
- F. Field welding or other field attachment of metal assemblies to embedded anchorages shall be accomplished by DSC. Where adjustable anchors are required, furnish anchors to frame installers for setting. Concrete unit masonry provider shall grout frames set into concrete blocks, including intermediate mullions or tubular elements (provide grouting and curing instructions).

3.03 ADJUSTMENT, REPAIRING

- A. Before final connections to electrical power are made, test all electrically operating or sensing items and adjust as required to provide proper functions. Test electrically controlled doors utilizing the control consoles under normal operating procedures.

- B. Adjust and lubricate moving parts to operate smoothly and quietly, without binding.
- C. Work shall be free from scratches, dents, permanent discoloration, and other defects; remove and replace damaged parts, surfaces with imperfections or damage during installation or thereafter before time of final project acceptance. Prior to touch-up painting, remove foreign material from metal surfaces including connections. Touch-up welds, bolted connections, and all abraded/damaged areas in shop applied metal primer paint.

3.04 PROTECTION, CLEANING

- A. Comply with Division 1 requirements.
- B. During installation, protect adjacent surfaces and detention equipment from damage. Work shall be free from scratches, dents, permanent discoloration, and other defects; remove and replace damaged parts and surfaces with imperfections before the final project acceptance.
- C. During installation, maintain storage and work area, and installation locations, in neat, orderly, broom clean condition.
- D. Remove all non-permanent labels, non-permanent protective coatings and identifying marks, and thoroughly clean all surfaces, including concealed work. Remove foreign materials prior to inspections for project closeout.
- E. DSC shall advise General Contractor of required procedures for protection of complete detention work. Advice shall extend through period of installation of other work near detention work, and through remainder of construction period, for the purpose of assurance that detention equipment will not be damaged.
- F. All final cleaning shall be the responsibility of the General Contractor.

3.05 DEMONSTRATION, OPERATING INSTRUCTIONS AND TRAINING

- A. The objective of the provided operating/maintenance manuals, training materials and instruction period shall be to communicate a total understanding of operations and maintenance of all detention equipment included in the work. Submit proposed operating/maintenance materials and training materials for review, comment and approval by the Architect and Owner. Coordinate with Owner to review materials and instruction periods, to assure Owner instruction and information requirements will be met. Obtain approval prior to scheduling training session.
- B. On-Site Training: Provide representative to Owner who are knowledgeable in operation of detention equipment, and who have thorough knowledge of its mechanisms and operation, for an on-site instruction and training period involving Owner's designated personnel. Representatives must be capable of training personnel in the adjustment and operation of detention equipment including pertinent safety requirements, and instructing maintenance personnel in their operation, repair, and upkeep. Instruction shall be given during the first week after the system has been accepted and turned over to the Owner for regular operation, except if detention equipment adjustment and/or repairs are required for its use. In such cases, training sessions are not to occur until such adjustments and/or repairs have been satisfactorily completed.
 - 1. On-site instruction and training period will not exceed five (5) consecutive eight (8) hour days

END OF SECTION

SECTION 111910 SECURITY HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SCOPE OF WORK:

- A. The work covered by this Section includes the furnishing of all labor, material, equipment and incidentals required to manufacture detention hollow metal, Scheduled in the Drawings as 'SHM' as indicated in the drawings or herein specified.
- B. Related Documents:
 - 1. Architectural drawings and general provisions of the Contract, including General and Supplementary Conditions.
- C. Related products furnished by others but not specified in this section.
 - 1. Door Hardware, including food pass hardware
 - 2. Security Glass and Glazing Materials
 - 3. Gaskets and Weather-stripping
 - 4. Intercoms
 - 5. Caulking and Adhesives
 - 6. Grouting of Frames
- D. Related Sections
 - 1. Section 11190 - Basic Detention Equipment Requirements

1.02 REFERENCES

- A. ASTM A366, Steel, Carbon, Cold rolled, Commercial Quality
- B. ASTM A569, Steel, Carbon, Hot Rolled Sheet and Strip, Commercial Quality
- C. ASTM A525, Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process, General Requirements
- D. ASTM A526, Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process, Commercial Quality
- E. ASTM A167 and A240, Stainless Steel Type 304

1.03 SUBMITTALS

- A. Shop Drawings: Manufacturer shall provide shop drawings for review and approval which include at least the following:
 - 1. Door and frame elevations and sections
 - 2. Manufacturers standard instructions for frame installation and for material handling and storage.
 - 3. Schedule of openings including dimensions, gauges, anchors and label requirements.
 - 4. Location and details of openings in frames or doors.
 - 5. Glazing types and stops
- B. Testing and Performance

Doors and frames shall meet the following minimum test standards. Compliance with test requirement shall be certified by reports of independent testing agencies. Test reports shall indicate the construction of the samples tested with sufficient particularity that construction can be verified.

 - 1. Static Load Test: This test is intended to verify the integrity of the door construction system employed by the manufacturer. With a 36" by 84" door panel supported by both ends, and load applied equally one fourth of the distance from each end, the test panel shall deflect not more than 0.58" at the center and shall rebound to not more than 0.10" when load is removed.

Door Gauge	12	14	16
Test Load	14,000#	14,100#	8,000#
 - 2. Rack Load Test: This test simulates a prying attack on a corner of the door. A 36" by 84" test panel is rigidly restrained at one end. A third corner is simply supported. Loads are applied and deflections measured at the fourth corner. Under the following loads, deflection shall not exceed the amounts shown.

Door Gauge	12	14	16

Test load	7,500#	7,500#	4,000#
Permitted Deflection	3.2"	3.2"	2.6"
3. **Door Impact Test:** This test simulates a battering attack on a door and frame assembly, using impacts of 200-foot pounds applied to the stop side of the door by a steel pendulum having a 4 square inch hitting surface. 12 and 14 gauge doors shall be secured with a SSCO 1080-1 lock installed in a door pocket. 16-gauge doors shall be secured with a SSCO 2" narrow jamb lock mounted in a frame jamb. Door shall remain closed during testing and be fully operable following the test.
- | | | | |
|----------------------|-----|-----|-----|
| Door Gauge | 12 | 14 | 16 |
| Hits (6" from bolt) | 400 | 400 | 200 |
| Hits (6" from Hinge) | 150 | 150 | *50 |
- *Center hinge only
4. **Edge Crush Test:** This test stimulates a crushing attack on the edge of the door and also demonstrates the door's resistance to buckling across the surface. At the center of the edge of a 36" by 36" flush door panel, apply load using a 1 1/2" diameter steel cylinder. Load shall be applied in the plane of the door, and the axis of the cylinder shall be perpendicular to the plane of the door. Ends of the test panel shall not be restrained.
- | | | | |
|--|---------|---------|--------|
| Door Gauge | 12 | 14 | 16 |
| Min Load Supported at 0.25" Deflection | 8,000# | 8,000# | 3,500# |
| Load supported without collapse | 15,000# | 10,000# | 6,000# |
5. **Removable Glass Stop Testing:** Prepare a 12-gauge test window frame of 28" by 33" glass opening, and glaze it with a 3/8" steel plate. Security screw spacing shall be the manufacturer's standards. Subject the test frame to 400 impacts of 200-foot pounds each on the steel glazing panel within 6" of a single corner. Stops must remain in place, and not more than one screw may be broken upon completion.
6. **Louver Impact Test:** Where louvers by door and frame manufacturer are specified, provide test report demonstrating the louver construction has been subjected to (50) 200 foot blows on the louver blades, applied with a steel pendulum having a 4 square inch striking surface, without failure of the louver and without being able to pass a flat, rigid item through the louver upon completion of the test.

1.04 QUALITY ASSURANCE

- A. Materials covered by this section shall be supplied only by manufacturers who have at least ten years of experience supplying detention grade hollow metal.
- B. The following suppliers are approved and are acknowledged to have met the standards contained in this paragraph 1.04:
1. Claborn Manufacturing, Tanner, AL
 2. Titan Steel Door, LLC, Murrayville, GA
- C. Others seeking approval as a hollow metal supplier shall submit the following requested information to the architect at least ten (10) days prior to bid date. If approved, notification shall be the addenda:
1. Evidence that the firm has a minimum of ten (10) years successful experience in completing projects of similar scope and magnitude with products similar to those specified herein.
 2. A list of completed projects including not fewer than five (5) which have been successfully in operation for at least five (5) years, including contacts at each facility with addresses and phone numbers.
 3. A list of all projects in the past five (5) years as to which the proposed supplier has been involved in litigation with a city, state or federal government agency, describing the status of result in such litigation.
 4. Copies of all test reports required elsewhere in this section.
 5. The following samples:
 - a. Door
 - (1) 1'0" by 1'0" corner sample with hinge mortise and reinforcement showing construction.
 - (2) 6 x 6 sample of interior door construction without edge or other reinforcing.

- b. Frame
 - (1) 1'0" by 1'0" corner section showing joint of head to jamb. Include hinge mortise, reinforcement and grout guard in one rabbet. Apply glazing stop on the opposite rabbet including corner joint.

1.05 WARRANTY

- A. Products supplied under this section shall be warranted by the manufacturer to be free of defects in material or workmanship for a period of one year.

PART II - PRODUCTS

2.01 MATERIALS

- A. Doors and frames shall be constructed using new, commercial quality hot or cold rolled steel, or stainless steel as identified in the architectural drawings. Steel used shall be in conformity with Paragraph 1.02 of this Section.

GLASS MOLDINGS

- A. Where specified or indicated on drawings, doors and frames shall be supplied with removable glass moldings. These shall be formed steel angles of 12 gauge minimum. Where dimensional restrictions preclude use of an angle, offset surface mounted stops may be used. All stops shall have tightly fitted butted or mitered corners and shall be secured with ¼" - 28 torx head security screws no more than 8" on center.

3.02 DOOR CONSTRUCTION

- A. General: All door face sheets shall be 12 gauge unless specified differently. Manufacturer's door reinforcements and fabrication techniques shall be consistent with, or more substantial than, the construction employed in doors tested to demonstrate compliance with the performance requirements herein.
- B. Specific Additional Reinforcement: The following reinforcement requirements shall also be met:
 - 1. Doors shall be internally reinforced with one of the following systems:
 - a) Continuous steel truss design core material, 28 gauge minimum, having truncated triangular sections extending continuously from one door face to the other, spot welded to each face 2 ¾" oc horizontally and 3" oc vertically. Core material to extend full height and width of door.
 - b) Rolled or formed 1/8" steel channels extending from top to bottom of door and continuous from one door face to the other, spaced not more than 4" oc and spot welded to door faces not more than 3" oc vertically.
 - c) Continuous vertical hat sections, on such hat section welded to each face of the door, 16 gauge minimum, with vertical webs no more than 4" apart, spot welded to faces no more than 3" oc vertically. Hat sections shall be welded to each other at least every 6" oc both sides to prevent door separation. An additional full height edge stiffener in the form of a 1/8" channel shall be installed and welded to both faces not more than 4" oc.
 - 2. Door edges shall be provided with additional reinforcing to prevent prying or compression attacks on the door edge. The thickness of the door edge, including this reinforcing, shall be not less than 5/32" for 12 and 14 gauge doors and 1/8" for 16 gauge doors. This reinforcing must be welded directly to the door edge.
 - 3. Top and bottom of the door shall be closed with a 12 gauge formed channel, 16 gauge for 16 gauge doors. Top and bottom closing channels shall be welded to the reinforcing edge. Top and bottom of doors shall be finished flush with inverted channels of not less than 14 gauge, 16 gauge for 16 gauge doors.
 - 4. Hinge reinforcements shall be minimum 3/16" thick of the size and shape utilized in testing. They shall be projection welded to the door edge, and after installation additionally electrically spot welded to the door edge. In addition, a backup channel stiffener of not less than 14 gauge shall be welded to each hinge reinforcing and to each door face, to prevent rocking failure of the hinge reinforcing.
 - 5. Swing door edges shall be beveled 1/8 in 1". Sliding doors shall have square edges.
 - 6. Hardware preparation - Doors shall be reinforced, drilled, tapped and prepared for templated mortised hardware only, in accordance with a final approved hardware schedule and templates

provided by the hardware supplier. Where surface hardware is to be applied, doors shall be reinforced only. Reinforcing dimensions shall be as follows:

- a) Surface Mounted Hinges - Minimum 3/8" reinforcing
 - b) Mortised Hinges and Pivots - 3/16"
 - c) Internal Reinforcing for Other Hardware - 12 ga
7. Louvers - Louvers, if required, shall be of the inverted V type with blades formed from 10 gauge minimum material and positioned so that no rigid flat object can be passed through them. Louver design shall meet the performance standards set out in Paragraph 1.08.
 8. Speakers - Speaking devices shall consist of a rectangular pattern of round holes, not exceeding 1/4" in diameter in both face sheets. The hole pattern shall be at least 4" by 5". The space between the hole patterns shall be baffled with steel sections of not less than 18 gauge so that objects cannot be passed through the door.
 9. Food Pass Openings shall receive a 3/16" steel plate door and keeper. The lock and hinges shall be furnished by the Security Hardware Supplier.
- C. Doors shall have the Architects' mark number permanently stamped on the center hinge reinforcement for swing doors and on the top for sliding doors.
- D. Field Examination: If directed by the architect, the erector shall destroy a randomly selected security hollow metal door by sawing it in half. When examination discloses door construction at variance with the details shown in performance test reports (Paragraph 1.08), the door manufacturer shall replace all non-conforming doors shipped to the project with doors constructed in conformance with construction of doors tested. Under conditions of non-conformity, the door manufacturer shall pay for the destroyed door and related labor. When examination proves that the door construction is consistent with tested doors, the owner will pay to replace the destroyed door and related labor.

3.03 FRAME CONSTRUCTION

- A. General: All frames shall be 12 gauge, except for 14 gauge for applications with 16 gauge doors. All frames shall be formed of hot or cold rolled steel produced in accordance with ASTM A569 or ASTM A366. Frames scheduled as galvanized shall be in accordance with ASTM A526 (A60). Frames shall be straight, neat in appearance, and free of warpage and buckling. All frame joints shall be welded, except where overall size of frame precludes shipment, in which case appropriate splices shall be provided for field erection by others. Following fabrication, welded areas of galvanized frames shall be re-sprayed with a cold galvanizing product complying with mil spec. P.46105.
- B. Frame Details:
1. Jamb, head and sill profiles shall be as scheduled or shown in architectural drawings. Stop height for frames shall be one inch (1") for glass openings and 5/8" for door openings.
 2. Corner joints shall have all contact edges closed tight with faces mitered and stops butted or mitered. Corner joints shall be continuously welded, and the use of gussets or splice plates is unacceptable.
 3. Frames for multiple openings shall have mullion members which are closed tubular shapes conforming to profiles shown on drawings and which have no visible seams or joints.
 4. Frames shall have the architect's door number permanently stamped in the center hinge reinforcement. Where frames do not receive hinge preparation, number shall be stamped in a prominent location, where it will not be visible after installation.
 5. Frames shall be mortised, reinforced, drilled and tapped for all templated mortised hardware only, in accordance with the final approved hardware schedule and templates provided by the hardware manufacturer. Where surface mounted hardware is to be applied, frames shall be reinforced only - all drilling and tapping shall be done by the erector.
 6. Mortised hinge and pivot reinforcement shall be a minimum of 3/16" thick, 1 1/2" wide and 9" long. Reinforcements shall be projection welded to the frame and shall be MIG welded to the frame at top and bottom of each reinforcing. The top hinge shall be additionally reinforced with a 3/16" thick formed angle welded both to the hinge reinforcing and frame face.
 7. Drilling and tapping of frames for surface mounted hinges shall be by field erector, after door is fitted plumb and true into frame.
 8. Other Reinforcements: The following applications shall be reinforced as indicated:
Lock Bolt Opening Backup 12 gauge minimum

Surface Mount Closers 12 gauge minimum
Concealed Closers 3/16" minimum
Strike Mounting Clips 3/16" minimum

9. Floor clips shall be provided of gauge at least as great as the frame gauge and shall be welded in place at the bottom of each jamb. They shall have two holes for anchoring to floor. If so scheduled, adjustable floor clips shall be provided.
 10. Frames shall be caulked to limit leakage of grout into frame openings.
- C. Jamb Anchors
1. Masonry - Provide a minimum of three (3) T-type corrugated masonry anchors for each jamb mounted in masonry up to 84" in length. Anchors shall have holes in them permitting insertion of reinforcing bar. For longer jambs, provide sufficient anchors to permit maximum spacing of 24". Where dictated by fire rating testing laboratory procedures, supply anchors complying with such requirements.
 3. Prefinished Masonry, Concrete Openings - Factory punched and countersunk holes for 3/8" diameter expansion bolt anchors, not more than 6' from top and bottom of jamb and 24" on center. Weld in 12 gauge minimum reinforcing chairs to prevent frame deformation while tightening anchor bolts. Concrete anchors and bolts shall be provided under the general contract.
 4. Mortar Guards of not less than 24 gauge steel shall be welded in place at all hardware mortises on frames to be set in masonry or concrete. Guards for closers shall be 18 gauge minimum.
 5. All frames shall be provided with two temporary steel spreaders welded to the feet of the jambs to serve as bracing during shipping and handling only. These shall be removed prior to installation and not to be used for setting of proper frame tolerances.

3.04 FABRICATION AND WORKMANSHIP

- A. All material shall be smooth and free of surface blemishes. Gauge of frame members and door face sheets shall be as indicated in the architectural drawings. Doors and frames shall be neat in appearance and free from warpage or buckle. Edge bends shall be true and straight.

3.05 PRIME PAINTING

- A. Doors and frames shall receive one coat of the manufacturer's shop primer which shall be compatible with topcoats specified in Section 09990. Prior to painting, doors shall be pressure sanded on both faces to minimize welding marks and to remove dirt or grease. Frames shall be high temperature washed and phosphatized to ensure paint adhesion. Paint shall be a minimum of 2 mils dry thickness and shall be applied in an even manner without drips or runs, and in accordance with paint manufacturer's specifications.
1. See specification section 099123 - Interior Painting.

PART III - EXECUTION

4.01 HANDLING AND STORAGE OF MATERIALS

- A. Frame erector shall receive material at jobsite, unload it, note any damage and file any required freight claims, and store the material, all in accordance with Manufacturer's instructions.

4.02 INSTALLATION

- A. Prior to installation, frame erectors shall check frames for size, swing, squareness, alignment, twist and plumbness. Conduit connections shall be checked to assure that they have not loosened during shipment. Screw protection, if provided, shall be checked to assure that it has not been removed or tampered with.
- B. Install frames as set forth in Manufacturer's instructions with jambs parallel, frame faces in the same plane and parallel with wall surfaces, frames set squarely in openings. Maximum deviation shall be 1/16" in any such dimension as described in Manufacturer's installation instructions.
- C. Any scratches or paint damage which has occurred during installation shall be cleaned and touched up with primer.

END OF SECTION

SECTION 111920
SECURITY HARDWARE AND DOOR CONTROL SYSTEM

PART 1 GENERAL**1.01 WORK INCLUDES:**

- A. The work covered by this Section includes the furnishing of all labor, materials, equipment and incidentals required to manufacture the security hardware as indicated in the drawings and herein specified.
- B. Related Work:
 - 1. Division 11 Section 11190, "Basic Detention Equipment Requirements" for general requirements for detention equipment subcontract.
 - 2. Division 11 Section 11191, "Security Metal Doors and Frames."
 - 3. Division 11 Section 11198 for security controls and control wiring to electrically operated hardware.

1.02 REFERENCES

- A. ASTM F1577-95 Test Methods for Detention Locks for Swing Doors
- B. ASTM F1643-95 Test Methods for Detention Sliding Door Locking Device Assembly
- C. National Electrical Code, latest edition, for internal electrical requirements for hardware.

1.03 SUBMITTALS

- A. Make submittals in accordance with the requirements of Division 1 Section "Submittals" and Division 11 Section 11190 "Basic Detention Equipment Requirements."
- B. Submit specifications, installation instructions and general recommendations for products as required, including locks, hinges, lock mount covers, bolt keepers, wall bumpers, weatherstripping, thresholds, escutcheons, etc.
- C. As outlined in Division 11 Section "Basic Detention Equipment Requirements", submit one sample of each hardware product, finished as required and tagged with full description for coordination with hardware schedule. Samples will be used as extra stock, if approved. Rejected samples will be returned.
- D. Hardware and Keying Schedules:
 - 1. Submit one reproducible and one copy of each schedule type; indicate all products by name and number of each separate opening. Include all other pertinent hardware information.
 - 2. Door Keying Plans: Submit one reproducible and one copy of each plan. Each plan shall include all building floor plan drawings (1/8-scale minimum) dimensions or other equipment information shall be excluded from this plan. Each plan shall include:
 - a. Architectural room numbers
 - b. Electrically controlled or operated doors are to be identified with an "E" symbol.
 - c. Lock types are to be prefixed as follows: "P" for paracentric, "M" for mogul, "S" for standard and "HS" for high security
 - d. Keymarks for each door opening include key switches and food pass identified as part of the opening.
 - e. Key access sides required at each detention opening.
 - 3. Make promptly, any corrections or changes necessary in schedules to comply with requirements; resubmit one reproducible and one copy of revised schedules.
 - 4. Do not group doors with like or similar hardware under a single heading.
- E. Templates for Fabrication:
 - 1. Forward templates for each type of detention equipment hardware required to fabricators of work in Division 11 Section 11191, "Security Hollow Metal" following final review of hardware and keying schedules.
 - 2. Submit wiring diagrams for all electrical devices provided herein.
- F. Locking Device Shop Drawings:

1. Indicate layout plans of each opening at 1/2" = 1'-0" minimum scale, show anchorage and accessory items, dimensions and finishes. Note: Complete housing module plans can be drawn at 1/4" = 1'-0" minimum, with typical enlarged plans.
 2. Indicate complete details of internal components of sliding door locking mechanisms located in transoms and jambs.
 3. Indicate permissible tolerances for each type.
- G. Closeout Submittals - Furnish three copies of Operating/Maintenance Manuals including parts list for security locks and locking devices.

1.04 QUALITY ASSURANCE

- A. Throughout the specifications and drawings, types of materials may be specified by the manufacturer's name and catalog number to establish standards of quality and performance. If the bidder elects to substitute any other products, he must request the Architect's approval in writing no later than ten (10) days prior to the bid date, and he must receive written approval by addendum. The following are requirements for approval for each type of product listed.
1. For each facility, list: name and location of installation, date of occupancy by Owner, Owner's representative to contact and telephone number, Construction Manager or General Contractor and Architect.
 2. Manufacturer's Qualifications: Provide security equipment products from manufacturers who have been actively engaged in the production of security equipment for a minimum of ten (10) years in successfully completed projects of equal scope and magnitude with products as herein specified. This evidence shall consist of a list of ten (10) projects that have been complete and operational for a minimum of five (5) years. The manufacturer shall now be actively engaged in the design and manufacture of security locks, locking devices, furnishings and miscellaneous security hardware and products. All locks, locking devices and related security hardware shall be provided by the same manufacturer.
 - a. For each facility, list: name and location of installation, date of occupancy by Owner, Owner's representative to contact and telephone number, Construction Manager or General Contractor, and Architect.
 3. Two (2) copies of manufacturer's product specifications and catalog cut sheets and detail and performance data for each type of product listed in this section.
 4. Provide data substantiating that products being proposed for this project comply with the requirements stated herein.
 5. List of projects under construction
 6. List of Completed projects.
 7. List of major suppliers.
- B. Approved Detention Hardware Suppliers:
1. Southern Steel Company, San Antonio, TX
 2. Airteq, Montgomery, AL
 3. Substitutions: Section 016000 - Product Requirements.

1.05 PRODUCT HANDLING

- A. Comply with requirements of Division 11 Section 11190 "Basic Detention Equipment Requirements."
- B. For products delivered to door manufacturer and for products delivered to project site, package each item of hardware separately in containers, complete with necessary fasteners, installation instructions and installation templates. Mark each container with item numbers, location of installation in accord with corresponding information shown on final hardware schedule.
- C. Store products at site to prevent damage or loss until installation is made.
- D. Control handling and installation of hardware products which are not immediately replaceable, so that the completion of work will not be delayed by hardware losses, both before and after installation.
- E. Deliver all keys in one shipment by secure carrier (hand carrier or registered mail from manufacturer directly to authorized representative of the Owner, as directed by the Architect-Engineer. Include transmittal and forward copy of same to the Architect-Engineer.

1.06 WARRANTY

- A. Comply with requirements of Division 11 Section 11190 "Basic Detention Equipment Requirements."

1.07 MAINTENANCE

- A. Provide spares in the quantities listed below for each hardware type: One of each will be provided as spare or unless required hereafter.
1. Locks: One spare of each type used for every ten locks provided
 2. Hinges: One spare of each type used for every ten hinges provided.
 3. Door Position Switch (DPS): One of each type used for every ten provided.
 4. Closer: One of each type used for every ten closers provided .
 - 5.
- B. Furnish, for institution use only, four complete sets of:
1. Special tools required for locking device and hardware maintenance

PART 2 PRODUCTS**2.01 MANUFACTURER:**

- A. Catalog numbers of the first manufacturers listed have been used to establish the quality required. The only other manufacturers approved are listed. Other manufacturers seeking approval shall do so in writing per General Requirements and shall list exact catalog numbers and description of the items proposed to furnish.

ITEM	1	2	3
Hinges	Southern Steel	Airteq	Hager
Closers	LCN	Norton	Yale
Stops	H.B. Ives	Glynn-Johnson	
Holders, Surface			
Bolts	Glynn-Johnson	Checkmate	Yale
Push, Pull	Hiawatha	Brookline	
Thresholds	Pemko	Reese	Zero
Weatherstrip	Pemko	Reese	Zero
Security Hardware	Southern Steel	Airteq	
Silencers	Trimco		

- B. DESIGNATIONS: The following abbreviations identify listed manufacturers:

1. Airteq Airteq, Montgomery, AL
2. Brookline Brookline Industries, Chicago, IL
3. Checkmate Rixon, Inc.; Franklin Park, IL
4. Glynn-Johnson Glynn-Johnson Corp.; Chicago, IL
5. Hager Hager Hinge Co.; St. Louis, MO
6. Hiawatha Metalcraft, Inc.; Minneapolis, MN
7. Ives H. B. Ives Div.; New Haven, CT
8. LCN LCN Closers; Princeton, IL
9. Norton Norton Closer Div.; Charlotte, NC
10. Pemko Pemko Mfg. Co.; Emeryville, CA
11. Reese Reese Enterprises; Rosemount, MN
12. Southern Steel Southern Steel Co.; San Antonio, TX
13. Zero Zero Weatherstripping; Bronx, NY

2.02 SCREWS, FASTENERS AND TOOLS:

- A. Furnish exposed fasteners to match item fastened. Make fastener of the same metal as item fastened, except use plated brass or stainless steel for all aluminum items. Provide twenty (20) spares of each type of fastener used for anchoring hardware.

- B. Provide torx-head (star design with center pin) security fasteners for exposed fasteners on all security hardware, regardless of manufacturer. Furnish six (6) tool holders and six (6) bits for each different size screw. Holders and bits shall be left at project after installation and become property of the user.

2.03 HINGE

- A. Heavy Duty 4-1/2" FM Hinge
 - 1. Series/Manufacturer:
 - a. 204FMSS/Southern Steel
 - b. 604FMCS Stainless Steel/Airteq
 - 2. Description:
 - a. 4-1/2 x 4-1/2, 3/16: thick leaves minimum
 - b. Cast stainless steel leaves, stainless steel non-removable pin, two hardened steel ball bearings, three knuckles with HT hospital tips.
 - c. 1/2" diameter pin to lock hinge in closed position.
 - 3. Provide quantities as follows:
 - a. Doors less than 5 ft high - 1 pair
 - b. Doors over 5 ft to 7 ft 6 in high - 1-1/2 pair
 - c. Doors over 7 ft 6 in to 10 ft high - 2 pair
 - 4. Doors over 3 ft 8 in width - 2 pair
- B. Full Surface Hinge
 - 1. Series/Manufacturer:
 - a. 203FS/Southern Steel
 - b. 603/Airteq
- C. Description:
 - a. 3" H x 2-3/4" W, 1/4" thick steel leaves.
 - b. Cold rolled, case hardened steel pin

2.04 SECURITY LOCKS

- A. Medium/Maximum Security - Electrical Operation
 - 1. Series/Manufacturer:
 - a. 10120 AM/Southern Steel
 - b. 9900 Series/Airteq
 - 2. Frame mounted, 115 VAC motor
 - 3. Internal Switches monitor status of bolt
 - 4. Bolt is retracted manually by mogul key at the door.
 - 5. Bolt is retracted electrically by remote push button.
 - 6. Bolt remains retracted until door is opened.
 - 7. Lock operates in a fail secure mode
 - 8. Galvanized case and cover

2.05 LISTED FOR USE ON 3-HOUR DOOR.

2.06 PULLS

- A. Series/Manufacturer:
 - 1. 212C/Southern Steel
 - 2. 612/Airteq
 - 3. Description: Cast brass, US26D, 8-11/16" L x 1-3/4" W x 2-3/8" projection. Fasteners shall be 2-3/8" - 16 x 3/4" security screws.
- B. Series/Manufacturer:
 - 1. 214S/Southern Steel
 - 2. 614/Airteq
 - 3. 2. Description: Cast brass, US26D, 5" high x 4" wide x 1" deep. Fasteners shall be 1/4"- 20 x 5/16" security screws.

2.07 FINISHES:

ANSI U/S Symbol Symbol Description
Hinges, Exterior US32D 630 Satin Stnls Stl
Hinges, Interior US26D 626 Satin Chrome
Locks & Pulls US26D 626 Satin Chrome
Closers AL 689 Aluminum Painted
Push, Kick US32D 630 Satin Stnls Stl
Stops US26D 626 Satin Chrome

2.08 CYLINDERS, KEYS AND KEYING:

- A. The security locks will be incorporated into two (2) separate keying systems; one for lever tumbler (Paracentric), and one for pin tumbler (mogul cylinder) and one for commercial cylinder locks. Each keying system's keys shall be dyed stamped for identification; corresponding to the hardware supplier's final schematic keying chart (See Paragraph 'E').
- B. Lever tumbler locks shall be keyed alike or different as directed. Provide cut keys as required.
- C. Mogul cylinder locks shall be master keyed as directed. Provide cut change keys, and master keys as required.
- D. For all individual key designations, to each required individual Key Cabinet, there shall be two (2) keys provided. For each master key designation, there shall be three (3) keys for each required individual key cabinet.
- E. A complete, detailed schematic chart of the keying system will be required. The hardware supplier will also be required to enter the key symbols for all doors on additional floor plans which will be supplied by the Architect. Two (2) copies of the schematic keying chart and architectural floor plans shall be turned over to the user at the completion of the project. The cost for this service shall be included with the cost of materials at the time of bidding.

2.09 SECURITY HARDWARE SCHEDULE

- 1. SHS-1 1155A
3 AIRTEQ 604 FMCS HINGE
1 Airteq 9924 X K2 MOTORLOCK
1 AIRTEQ 612 RAISED PULL
1 AIRTEQ 614 FLUSH PULL
1 LCN 2215 CLOSER W/DPS
1 WEATHERSTRIPPING
1 THRESHOLD
- 2. SHS-2 1143B, 1148A
3 AIRTEQ 604 FMCS HINGE
1 Airteq 9924 X K2 MOTORLOCK
1 AIRTEQ 612 RAISED PULL
1 AIRTEQ 614 FLUSH PULL
1 LCN 2215 CLOSER W/DPS
- 3. SHS-3 1130A, 1142A, 1145A, 1146A, 1146B, 1147A, 1149A, 1150A, 1151A, 1152A, 1153A, 1153B, 1153C, 1154A, 1159A, 1159B, 1160A, 1162A, 1163A, 1154A,
3 AIRTEQ 604 FMCS HINGE
1 Airteq 9924 X K1 MOTORLOCK
1 AIRTEQ 612 RAISED PULL
1 AIRTEQ 614 FLUSH PULL
1 LCN 2215 CLOSER W/DPS
- 4. SHS-4 1128.1A, 1134A, 1134B, 1141A
AIRTEQ 9424 MOTORLOCK X K2
AIRTEQ HIGH SECURITY DPS

5. SHS-5 1135A, 1139A,
AIRTEQ HIGH SECURITY DPS

PART 3 EXECUTION

3.01 GENERAL

- A. Comply with requirements of Division 11 Section 11190 "Basic Detention Equipment Requirements."

3.02 INSTALLATION:

- A. Comply with requirements of Division 11 Section 11190 "Basic Detention Equipment Requirements."
- B. BAII shipping of detention equipment hardware and coordination with other detention equipment shall be the responsibility of the Detention Equipment Supplier

3.03 FIELD QUALITY CONTROL

- A. Comply with requirements of Division 11 Section 11190 "Basic Detention Equipment Requirements".

3.04 ADJUSTMENT AND REPAIRING

- A. Comply with requirements of Division 11 Section 11190 "Basic Detention Equipment Requirements".

3.05 PROTECTION AND CLEANING

- A. Comply with requirements of Division 11 Section 11190 "Basic Detention Equipment Requirements".

END OF SECTION

SECTION 111940
SECURITY FURNISHINGS**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1. Division 03481 and Division 11900 Specification Sections apply to this section.

1.02 SUMMARY

- A. Contractor shall be responsible for transport, assembly and installing security furniture as described in this section and drawings. All dimensions and anchorage locations must be verified.

1.03 WARRANTY

- A. Comply with requirements of Division 11, Section 11190 "Basic Detention Equipment Requirements."

PART 2 PRODUCTS**2.01 DETENTION MIRROR**

- A. Model/Manufacturer:
 - 1. 432/Southern Steel
 - 2. MI1000/Viking Products
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Construction:
 - 1. Mirror frame shall be 11-1/4" x 16-1/4", fabricated from 16-gauge cold finished steel, with 5/16" inner and outer flanges and having a tensile strength of not less than 53,000 pounds per square inch. Frame to have natural finish, chromium plated.
 - 2. Mirror plate shall be made of 20-gauge sheet steel, polished to a high degree of reflectivity, and chromium plated.
 - 3. Include eight (8) chromium plated, security type, flat head machine screws, 1/4" diameter of proper length for use in backer plate.
 - 4. Embed plate shall be 10-gauge steel with masonry straps for anchoring in block walls.

2.02 SECURITY GRAB BAR

- A. Manufacturer/Model:
 - 1. Viking/GB3600 (36")
 - 2. Bobrick/B6806.99 x 36
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Construction:
 - 1. Size: 36", 42"
 - 2. 18 ga type 304 stainless steel tube measuring 1-1/2" diameter welded to 10 ga type 304 stainless steel wall mounting plates. 3 anchor holes are equally spaced on each wall mounting plate. Grab bar includes a shop welded 10 ga anti-ligature closure plate with drain holes.

2.03 SECURITY RECESSED TOILET PAPER HOLDER

- A. Manufacturer/ Model:
 - 1. Acorn: Recessed Front Access Toilet Paper Holder
 - a. Model Number: 10840-FA
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.04 SECURITY MOP HOLDER AND SHELF

- A. Manufacturer / model:
 - 1. Acorn: Stainless Steel Rear- Mounted shelf with Hooks.
 - a. Model Numger: 1823
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.05 ANTI LIGATURE SHOWER RODS AND FLANGES

- A. Manufacturer/ model:

1. Direct Sell Group, LLC
 - a. Model Number U-1024-36-SS; 1 inch diameter 36" long, 20 guage.
2. Direct Sell Group, LLC
 - a. Model Number S-4650-SS; Break Away shoer rod flanges
3. Substitutions: See Section 01600 - Product Requirements.

PART 3 EXECUTION

3.01 GENERAL

- A. Comply with requirements of Division 11 Section "Basic Detention Equipment Requirements"

3.02 INSTALLATION:

- A. Comply with requirements of Division 11 Section "Basic Detention Equipment Requirements"

3.03 FIELD QUALITY CONTROL

- A. Comply with requirements of Division 11 Section "Basic Detention Equipment Requirements"

3.04 ADJUSTMENT AND REPAIRING

- A. Comply with requirements of Division 11 Section "Basic Detention Equipment Requirements"

3.05 PROTECTION AND CLEANING

- A. Comply with requirements of Division 11 Section 11190, "Basic Detention Equipment Requirements".

END OF SECTION

SECTION 111950
MEDIUM SECURITY METAL CEILINGS - BARRIERDECK

PART 1 - GENERAL**1.01 SUMMARY**

- A. Section includes security acoustical and non-acoustical plank metal ceilings including installation as scheduled in the contract drawings and as specified herein.

1.02 PRODUCTS PROVIDED UNDER THIS SECTION

- 1. Medium Grades 3 & 4 security single skin plank type acoustical and non-acoustical ceiling systems.

1.03 RELATED SECTIONS

- A. Section 09900 Painting
- B. Division 11 Security Equipment
- C. Division 15 Mechanical
- D. Division 16 Electrical
- E. Division 16 Electrical

1.04 REFERENCES

- A. ASTM A 1008/A 1008M-16, Specification for Steel, Sheet and Strip, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability
- B. ASTM A 1011/A 1011M-17a, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability
 - 1. ASTM A 653/A 653M-17, Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dipped Process (Commercial Steel)
- C. ASTM A 666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
- D. ASTM B 117-16, Standard Practice for Operating Salt Spray (Fog) Apparatus
- E. ASTM D 610-08, Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces
- F. ASTM D 714-02 (2009), Standard Test Method for Evaluating Degree of Blistering of Paints
 - 1. ASTM D 1735-14, Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus
- G. ASTM C 635-17, Standard Specification for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- H. ASTM C 636-13, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
- I. ASTM C 423-17, Standard Test Method for Sound Absorption and Sound Absorption Coefficient by the Reverberation Room Method
- J. ASTM F2696-15, Standard Test Methods for Physical Assault on Overhead Horizontal Fixed Barriers for Detention and Correctional Facilities
- K. ASTM E-84-17a, Standard Test Method for Surface Burning Characteristics of Building Materials.
- L. ISO 9001 International Standards Organization – Standards for Quality Management
- M. CISCA Guidelines
- N. PQ. Abbreviations:
 - 1. DEC: Detention Equipment Contractor
 - 2. ASTM: American Society for Testing Materials
 - 3. CISCA: Ceilings and Interior Systems Construction Association

1.05 TESTING AND PERFORMANCE

- A. Security grades for each security ceiling type shall be indicated on the reflected ceiling plan.

B. Acoustical Performance

1. **Single skin plank ceiling system shall provide a NRC of not less than .80 when tested in accordance with ASTM C 423 and a Sound Transmission Class (STC) of not less than 19 when tested in accordance with ASTM E 90 and ASTM E 413. See chart below for performance values.**
2. Acoustical fill flame spread index shall not exceed 15 with smoke developed value not exceeding 5 when tested in accordance with ASTM C 84.

C. Security Performance

These test methods are not to provide a measure of resistance for ceiling assemblies subjected to attack by corrosive agents. These test methods are intended to evaluate simulated forced exit resistance of a ceiling assembly to attacks using battering devices and static loading.

The primary purpose of these test methods is to approximate the levels of abuse to which ceiling assemblies may be subjected in the course of a forced exit in a correctional facility. The desired result of its use is to help provide insurance of protection and safety of the inhabitants or occupants of the facility where these ceiling assemblies will ultimately be used.

It is recommended that architects and building design personnel decide which security rating is required for each opening as described in Table 1.

1. Test Samples
 - a. A ceiling assembly covering an 8'-0" x 12'-0" (2,438mm x 2,438mm) area using the desired ceiling panel system shall be constructed in accordance with ASTM F2697 and installed in accordance with the manufacturer's instructions.
 - b. The manufacturer shall permanently mark the test samples and retain them at the manufacturing facility for future reference for a period of one (1) year from date tested. All tests will be verified using an independent agency. Test reports shall include photographs of the testing apparatus and installation instructions including templates for the items of hardware used.
2. Specimen Preparation
 - a. The construction and size of the test ceiling assemblies consisting of single skin ceiling panels, wall mounting channels and angles, hangers, and fasteners shall be representative of the application under investigation and the desired security classification needed for the application.
 - b. The test assembly shall be installed in a fixture constructed using structural steel tubing, channel and plate to provide a means for mounting a test section of ceiling in the horizontal position, and for applying the required series of impacts and static load applied upward at the target areas specified in the ASTM F2697 standard.
 - c. Mount the ceiling assembly under test in the rough opening in accordance with the manufacturer's installation instructions.
3. Test Procedures
 - a. Ceiling Assembly Impact Testing
 - 1) Impact testing under this section is performed using the methods and testing equipment described in ASTM F2697.
 - 2) Scope: These tests are designed to evaluate a ceiling assembly's ability to resist repetitive impact forces at the designated critical areas. The same assembly used for the static load tests may be reused for this test, or another assembly may be used if so desired.
 - 3) Significance of use: This test method is intended to closely simulate a sustained battering ram-style attack and provide an evaluation of the assembly's capability to prevent, delay and frustrate forced exit. This impacting simulates a person using a sledgehammer or another battering implement to escape or exit through the ceiling system.
 - 4) Apparatus: The test fixture described in paragraph 1.05.C.1.a and shown in Figure 1 in ASTM F2697 shall be used in this test.
 - 5) Ram: The impact device shall consist of a portable see-saw type impactor as shown in Figure 2 in ASTM F2697. The device shall be capable of delivering impacts of 200 ft. lbf. Against the test ceiling and be able to be positioned under the required target locations designated in Table 1 in F2697. The device shall be constructed such that a blunt

impactor (Figure 3 in F2697) or sharp impactor (Figure 4 in F2697) can be attached. Both impactors are to be fabricated from C101-1020 carbon steel. The blunt impactor shall have a striking surface area of $4 \pm .04$ sq. in. ($2580 \text{ mm}^2 \pm 25.8 \text{ mm}^2$) and shall have rounded edges similar to a 10 lb. (4.54 kg) sledge hammer head. The sharp impactor shall have a point similar to the end of a new Fireman's axe at the beginning of the test sequence.

- 6) Procedure: With the exposed (room) side of the ceiling facing downward, subject each location on the sample ceiling to the number of blows at the required impact energy and locations found in Table 1 in ASTM F2697. Starting with the blunt impactor, followed by the sharp impactor, deliver the required impacts at the specified foot pounds per impact in cyclic sequences of 50 impacts each. Repeatability of impact location during each series shall be no more than ± 2 (50.8mm) inches horizontally and vertically from the designated impact target. Specimen fails if a 5" x 8" x 8" (127mm x 203.2mm x 203.2mm) rigid rectangular box can pass through the ceiling following impacts.
- b. Static Load Testing (uplift)
 - 1) Scope: This test is designed to evaluate the capability of a ceiling assembly to resist a steadily increasing force applied at corner points, joints between ceiling panels, and the ceiling assembly's central point.
 - 2) Significance of Use: This test method is intended to simulate a ceiling assembly's resistance to uplift at vulnerable locations.
 - 3) Apparatus: The test fixture described in paragraph 1.05.C.1.a and shown in Figure 1 in ASTM F2697 shall be used in this test.

A hydraulic ram and pump equipped with a gauge or load cell shall be used to provide the static load. The pump ram and gauge shall be calibrated by the testing laboratory and a chart provided that converts pounds-force per square-inch gauge (kilograms per square meter) to pounds-force (Newtons). If a load cell is used, it shall be certified by the testing laboratory prior to use. (see Figure 5 Static Load Apparatus)
 - 4) Procedure: Apply static load to the attack side of the component at the locations and magnitude appropriate to the security rating desired in accordance with that specified in Table 1 in F2697 and using a 1/4 in. (6.3mm) thick by 12 in. (305mm) square contact plate. Specimen fails when 1) the desired load cannot be achieved without physical failure, or 2) if a 5" x 8" x 8" (127mm x 203.2mm x 203.2mm) rigid rectangular box can pass through the ceiling or, 3) if the permanent deflection exceeds the criteria in F2697 (25% of L180).
 - 5) Record the pass / fail results at 200 lb. increments to produce a graph, static load versus failure. Increase the load until target loads for each sample are reached.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualification

1. Manufacturer shall provide evidence of having personnel and plant equipment capable of fabricating ceiling assemblies of the type specified herein. Manufacturer shall provide current documentation of the number of employees, a listing of their production equipment, and a description of their manufacturing facility.
2. Manufacturers shall be ISO 9001 certified and shall be required to present their Certificate of Registration upon request. The manufacturer's registrar shall be nationally recognized and shall provide the manufacturer with periodic factory follow up audits reaffirming the manufacturer's continuing compliance with their written quality program.
3. Manufacturers shall have a minimum of five (5) years experience successfully producing security ceiling systems of the types and sizes required in the contract documents. Upon request the manufacturer shall provide a list of successfully completed projects and the dates they were completed.
4. Manufacturers shall have written test reports of their having passed the testing requirements of section 1.05 and using their current materials and production processes
5. Products other than those specified or approved will be considered if the following items are submitted to the Architect at least 10 days prior to bid due date.
 - a. Physical samples

- b. Test reports; the manufacturer shall submit to the architect an independent testing laboratory report certifying that ceiling assemblies meet the performance requirements of Paragraph 1.05 and are constructed in accordance with Paragraphs 2.01 of these specifications.
 - c. Qualifications; the manufacturer shall submit to the architect his qualifications as described in section 1.06.A.
 - d. Catalog and technical information
 - e. References (including name and telephone number or person to contact)
 - f. Notarized certification that the product conforms to the requirements, quality, and durability of the products specified herein
 - g. Notarized certification that manufacturer conforms to the manufacturer's qualifications required in this specification
 - h. Agreement to reimburse the Architect or Owner for costs associated with changing from the specified products. If a substitution is approved, it will be in the form of an addendum to the bidding documents.
- B. Acceptable Manufacturers
- 1. Trussbilt, LLC – Huron, SD
Telephone: 605.352.5283
Website: www.trussbilt.com
 - 2. Other manufacturers must submit their qualifications, test reports and product deviations to the architect ten (10) days prior to the bid for approval.
- C. Installer Qualifications
- 1. Refer to qualifications in section 111900
 - 2. The-installing contractor shall provide a list of three (3) projects where at least one project was 100 cells and has been in operation for at least five years.
 - 3. Technically qualified and experienced in furnishing and installing detention security acoustical panel.
 - 4. Have full time employees with a minimum of 5 years experience in furnishing and installing detention equipment and detention security systems.
 - 5. Direct distributor or dealer for the manufacturer of detention security acoustical panel system specified or approved.
 - 6. Submit evidence of prior experience in the installation of metal security ceiling systems.
- D. Quality Criteria
- 1. All ceiling construction shall be in accordance with construction of assemblies which meet the testing requirements of Section 1.05.
 - 2. Fabrication methods and product quality shall meet standards specified herein.

1.07 SUBMITTALS

- A. Submittal Drawings
- 1. Submit in accordance with Division 1.
 - 2. Provide detailed drawings including: layout of ceiling systems, details of construction, gauges of metal, anchoring details, conditions at openings, installation details and methods, and other data pertinent to the installation, including illustration of sequence of installation to accomplish interlocking panels.
- B. Samples
- 1. Supply a 1'-0" x 1'-0" (305mm x 305mm) section of each ceiling system being supplied showing wall mounting members and panel sections.
 - 2. All samples submitted shall be of the production type and shall represent in all respects the minimum quality of work to be furnished by the manufacturer. No work represented by the samples shall be fabricated until the samples are approved, and any downgrading of quality demonstrated by the samples can be cause for rejection of the work.

1.08 WARRANTY

- A. All ceiling systems work shall be warranted from defects in workmanship and quality for a period of one (1) year from shipment.

PART 2 - PRODUCTS**2.01 SECURITY CEILING SYSTEMS**

Security Grade 3 and 4 single skin inter-locking plank ceiling systems as manufactured by Trussbilt under the BarrierDek trade name.

A. MATERIAL

1. Panel face sheet minimum thicknesses shall be as follows:
 - Grade 3 - .093 in. (2.3mm)
 - Grade 4 - .067 in. (1.7mm)
2. Panel face sheets shall be made of commercial quality, level, hot or cold-rolled steel conforming to ASTM A 1008 / A 1008M CS Type B or ASTM A 1011/A 1011M CS Type B and shall have a zinc coating applied by the hot-dip process conforming to ASTM A 653/A653M Commercial Steel (CS), coating designation A60. The steel shall be free of scale, pitting, coil breaks or other surface blemishes. It shall also be free of buckles, waves or any other defects caused by the use of improperly leveled sheets.
3. For severely corrosive conditions and where specified, face sheets and components shall be stainless steel conforming to ASTM A 666, Type 304.

B. CONSTRUCTION

1. Single Skin Inter-Locking Plank Ceiling System – Security Grades 3 and 4.
 - a. Ceiling Planks: Shall be 24 in. wide and supplied in manufacturer's standard lengths of 8 ft., 10 ft., and 12 ft. All ceiling planks shall have factory formed inter-locking edges and may be perforated with 0.125 in. (3.2mm) diameter holes, staggered .218 in. (5.53mm) on center for a 29% open area or non-perforated.
 - b. Wall Perimeter Angles: Shall be formed angles 0.094 in. (2.38mm) minimum thickness and punched 16 in. (406mm) on center for 3/8 in. (9.52mm) diameter anchors. Panels shall be secured to the wall angles using 12 ga. concealed angle clips that can span panel joints.
 - c. Interim Tee Supports: Tee supports shall be two wall mounting angles bolted back-to-back using 3/8 – 16 bolts, 24 12 in. (305) on center.
 - 1) Suspension for tee supports shall be 3/8 in. (9.52mm) galvanized threaded rod, bolted to the above structure and the tee support, 36 in. (914mm) on center.
 - d. Fasteners: Any exposed fasteners shall be 1/4-28 pin Torx®, tamper-proof security screws or blind rivets. Wall anchor bolts shall be 3/8 in. (9.52mm) diameter and shall be placed 16 in. (406mm) on center. Anchors for securing the wall moldings to the wall shall be furnished by the ceiling manufacturer and shall meet the required seismic rating.
 - e. Acoustical material: The inside surface of all perforated ceiling pans shall be covered with a Class "A" black poly-encapsulated fiberglass insulation of sufficient thickness and density to provide the acoustical requirements as outlined in Section 1.05 of this specification.
 - f. MEP Penetrations: All light and air units are to be sized to fit into and trim off to full panel width openings and shall be independently supported from above by the trade requiring the opening. All panel penetrations are to cut in the field by the ceiling installer. Lights shall be secured to the panel to stabilize the perimeter of the penetration in the panel by the ceiling installer.
 - g. Finish: All components of the panel and suspension system visible from the floor side shall have a factory applied finish. Prior to painting, all surfaces shall be cleaned of rust, oil and other impurities by receiving a multi-stage pre-treatment consisting of degrease and phosphate coating, clear water rinse and non-chromate sealer and rinse, to condition the surface of the metal to resist and inhibit corrosion and promote paint adhesion. Finish to be applied after perforation to insure coating of the perforated holes. Panels and components shall be coated with TGIC Polyester or equal, white powder coat, applied at a minimum of 2 mils thickness (dry).

PART 3 - EXECUTION**3.01 DELIVERY, STORAGE AND HANDLING**

- A. Protect panels from damage during transit to job storage.

- B. Inspect panels upon delivery for damage. Minor damage may be repaired provided finish items are equal in respect to new work and acceptable to Architect/Engineer. Otherwise, remove and replace with new material.
- C. The installing contractor shall see that materials are properly stored on planks or dunnage in a climate controlled location. Panels shall be stored in a horizontal position and spaced by blocking. Materials shall be covered to protect them from damage but in such a manner as to permit air circulation.

3.02 INSTALLATION

- A. General
 - 1. Install ceiling system using the approved submittal drawings and contract documents. Install using the manufacturer's installation instructions.
 - 2. Accurately locate partitions, holes, cut outs and verify locations with other trades.
 - 3. Set closures and steel supports with anchors to suit condition.
 - 4. Erect true and level with close fitting tolerances.
 - 5. Bearing at ends shall be a minimum of 1 in. (25.4mm) unless noted otherwise in project drawings.
- B. Fastenings
 - 1. Fasten supporting members to each other and to building construction as detailed or as otherwise required to provide a secure, permanent installation.
 - 2. Where fastening spacings and sizes are not shown, use spacings and sizings of bolts, screws and which will develop the full strength of the members before failure occurs in the fastenings.
- C. Touch-up Painting
 - 1. Immediately after installation, areas where prime or finish coat has been damaged shall be sanded smooth and touched up with same primer or finish touch up paint as supplied by the manufacturer.
 - 2. Remove rust before touch up primer or finish paint touch up is applied.

3.03 FIELD QUALITY CONTROL

- A. Hold a meeting with other trades to review installation procedures and workmanship with a special emphasis on unusual conditions to ensure correct installation procedures.
- B. Security panel system shall be installed in place under the supervision of a qualified supervisor, trained and furnished by installer.

END OF SECTION

SECTION 111960
SECURITY METAL CEILINGS -SECUREDEK

PART 1 - GENERAL**1.01 SUMMARY**

- A. Section includes security acoustical and non-acoustical metal pan ceilings including installation as scheduled in the contract drawings and as specified herein.
- B. Metal pan ceilings are to be used in minimum security areas that are supervised.

1.02 PRODUCTS PROVIDED UNDER THIS SECTION

- A. Minimum security suspended metal pan type acoustical and non-acoustical ceiling systems.

1.03 RELATED SECTIONS

- A. Section 09900 Painting
- B. Division 11 Security Equipment
- C. Division 15 Mechanical
- D. Division 16 Electrical

1.04 REFERENCES

- A. ASTM A 1008/A 1008M-16, Specification for Steel, Sheet and Strip, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability
- B. ASTM A 1011/A 1011M-17a, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability
- C. ASTM A 653/A 653M-17, Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dipped Process (Commercial Steel)
- D. ASTM A 666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
- E. ASTM B 117-16, Standard Practice for Operating Salt Spray (Fog) Apparatus
 - 1. ASTM D 610-08, Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces
- F. ASTM D 714-02 (2009), Standard Test Method for Evaluating Degree of Blistering of Paints
- G. ASTM D 1735-14, Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus
- H. ASTM C 635-17, Standard Specification for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- I. ASTM C 636-13, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
 - 1. ASTM C 423-17, Standard Test Method for Sound Absorption and Sound Absorption Coefficient by the Reverberation Room Method
- J. ASTM F2696-15, Standard Test Methods for Physical Assault on Overhead Horizontal Fixed Barriers for Detention and Correctional Facilities
- K. ASTM E-84-17a, Standard Test Method for Surface Burning Characteristics of Building Materials.
- L. ISO 9001 International Standards Organization – Standards for Quality Management
- M. CISCA Guidelines
- N. Abbreviations:
 - 1. DEC: Detention Equipment Contractor
 - 2. ASTM: American Society for Testing Materials
 - 3. AWS: American Welding Society
 - 4. CISCA: Ceilings and Interior Systems Construction Association

1.05 TESTING AND PERFORMANCE

- A. Security ceiling type shall be indicated on the reflected ceiling plan. As follows: 18 gauge, perforated/non-perforated, backers/no backers
- B. Acoustical Performance
 - 1. Suspended pan type ceiling system shall provide the following Noise Reduction Coefficient (NRC) when tested in accordance with ASTM C 423 and in an E-400 mounting as defined in ASTM E 795 and Sound Transmission Class (STC) when tested in accordance with ASTM E 90 and ASTM E 413 based on the following designs:
 - 2. Type A: 2' x 2', 18 gauge, perforated, with 1.5 lb. fiberglass insulation; NRC = .85, STC = 5.
 - 3. Type B: 2' x 2', 18 gauge, perforated, with 1.5 lb. fiberglass insulation and 22 gauge backer panels; NRC = .70, STC = 19.
 - 4. Type C: 2' x 4', 18 gauge, perforated, with 1.5 lb. fiberglass insulation; NRC = .85, STC = 7.
 - 5. Type D: 2' x 4', 18 gauge, perforated, with 1.5 lb. fiberglass insulation and 22 gauge backer panels; NRC = .70, STC = 23.
 - 6. Acoustical fill flame spread index shall not exceed 20 with smoke developed value not exceeding 10 when tested in accordance with ASTM E 84.

- C. Security Performance

These test methods are intended to evaluate simulated forced exit resistance of a ceiling assembly to attacks using static loading. These test methods are not to provide a measure of resistance for ceiling assemblies subjected to attack by corrosive agents.

The primary purpose of these test methods is to approximate the levels of abuse to which ceiling assemblies may be subjected in the course of a forced exit in a correctional facility. The desired result of its use is to help provide insurance of protection and safety of the inhabitants or occupants of the facility where these ceiling assemblies will ultimately be used.

- 1. Test Samples
 - a. A ceiling assembly covering an 8'-0" x 8'-0" (2,438mm x 2,438mm) area using the desired ceiling panel system shall be constructed in accordance with ASTM F2697 and installed in accordance with the manufacturer's instructions.
 - b. The manufacturer shall permanently mark the test samples and retain them at the manufacturing facility for future reference for a period of one (1) year from date tested. All tests will be verified using an independent agency. Test reports shall include photographs of the testing apparatus and installation instructions including templates for the items of hardware used.
- 2. Specimen Preparation
 - a. The construction and size of the test ceiling assemblies consisting of pan type ceiling panels, wall mounting channels and angles, compression struts, main runners, cross tees, hangers, and fasteners shall be representative of the application under investigation and the desired security classification needed for the application.
 - b. The test assembly shall be installed in a fixture constructed using structural steel tubing, channel and plate to provide a means for mounting a test section of ceiling in the horizontal position, and for applying the load upward at the target areas specified in the ASTM F2697 standard.
- 3. Mount the ceiling assembly under test in the rough opening in accordance with the manufacturer's installation instructions.
- 4. Test Procedures
 - a. Static Load Testing (uplift)
 - 1) Scope: This test is designed to evaluate the capability of a ceiling assembly to resist a steadily increasing force applied at corner points, joints between ceiling panels, and the ceiling assembly's central point.
 - 2) Significance of Use: This test method is intended to simulate a ceiling assembly's resistance to uplift at vulnerable locations.
 - 3) Apparatus: The test fixture described in paragraph 1.05.C.1.a and shown in Figure 1 in ASTM F2697 shall be used in this test.

A hydraulic ram and pump equipped with a gauge or load cell shall be used to provide the static load. The pump ram and gauge shall be calibrated by the testing laboratory and a chart provided that converts pounds-force per square-inch gauge (kilograms per square meter) to pounds-force (Newtons). If a load cell is used, it shall be certified by the testing laboratory prior to use. (see Figure 5 Static Load Apparatus)

- 4) Procedure: Apply a 400 lb. static load to the attack side of the component at locations 1 thru 4 in accordance with Table 1 in F2697 and using a 1/4 in. (6.3mm) thick by 12 in. (305mm) square contact plate. Specimen fails when the desired load cannot be achieved without physical failure or the ability for egress.
- 5) Record the pass / fail results for each location.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualification

1. Manufacturer shall provide evidence of having personnel and plant equipment capable of fabricating ceiling assemblies of the type specified herein. Manufacturer shall provide current documentation of the number of employees, a listing of their production equipment, and a description of their manufacturing facility.
2. Manufacturers shall be ISO 9001 certified and shall be required to present their Certificate of Registration upon request. The manufacturer's registrar shall be nationally recognized and shall provide the manufacturer with periodic factory follow up audits reaffirming the manufacturer's continuing compliance with their written quality program.
3. Manufacturers shall have a minimum of five (5) years experience successfully producing security ceiling systems of the types and sizes required in the contract documents. Upon request the manufacturer shall provide a list of successfully completed projects and the dates they were completed.
4. Manufacturers shall have written test reports of their having passed the testing requirements of section 1.05 and using their current materials and production processes.

B. Installer Qualifications

1. The installer shall be an employer of workers trained and approved by manufacturer and has been in operation for at least five years.
2. Technically qualified and experienced in furnishing and installing detention security acoustical panel.
3. Direct distributor or dealer for the manufacturer of detention security acoustical panel system specified or approved.
4. Submit evidence of prior experience in the installation of metal security ceiling systems.

C. Quality Criteria

1. All ceiling construction shall be in accordance with construction of assemblies which meet the testing requirements of Section 1.05.
2. Fabrication methods and product quality shall meet standards specified herein.

1.07 SUBMITTALS

A. Submittal Drawings

- a. Submit in accordance with Division 1.
 - 1) Provide detailed drawings including: layout of ceiling systems, details of construction, gauges of metal, anchoring details, conditions at openings, installation details and methods, and other data pertinent to the installation, including illustration of sequence of installation to accomplish installation of suspended metal pan ceiling panels.

B. Samples (if required)

1. Supply a 1'-0" x 1'-0" (305mm x 305mm) section of each ceiling system being supplied showing wall mounting members and panel sections.
2. All samples submitted shall be of the production type and shall represent in all respects the minimum quality of work to be furnished by the manufacturer. No work represented by the samples shall be fabricated until the samples are approved, and any downgrading of quality demonstrated by the samples can be cause for rejection of the work

1.08 MAINTENANCE STOCK

- A. The manufacturer shall provide a minimum of 2% extra materials, including grid work and suspension materials.
 - 1. Security Ceiling Panels: Full-size units equal to 2 percent of amount installed
 - 2. Suspension System Components: Quantity of each grid and exposed component equal to 2 percent of amount installed
 - 3. Security Fasteners: Furnish not less than 1 box for each 50 boxes or fraction thereof, of each type and size of security fastener installed
 - 4. Tools: Provide two sets of tools for installing and removing security fasteners, packaged for easy handling and storage

1.09 WARRANTY

- A. All ceiling systems work shall be warranted from defects in workmanship and quality for a period of one (1) year from shipment.

PART 2 - PRODUCTS**2.01 SECURITY CEILING SYSTEMS**

- A. PRE-APPROVED ACCEPTABLE MANUFACTURERS AND PRODUCTS
 - 1. Suspension pan type ceiling systems as manufactured by Trussbilt under the SecureDek trade name. Others seeking approval need to provide the following within (10) days prior to bidding:
 - a. Physical samples
 - b. Test reports; the manufacturer shall submit to the architect an independent testing laboratory report certifying that ceiling assemblies meet the performance requirements of Paragraph 1.05 and are constructed in accordance with Paragraphs 2.01 of these specifications.
 - c. Qualifications; the manufacturer shall submit to the architect his qualifications as described in section 1.06.A.
 - d. Catalog and technical information
 - e. References (including name and telephone number or person to contact)
 - 2. Notarized certification that the product conforms to the requirements, quality, and durability of the products specified herein
 - a. Notarized certification that manufacturer conforms to the manufacturer's qualifications required in this specification
 - b. Agreement to reimburse the Architect or Owner for costs associated with changing from the specified products. If a substitution is approved, it will be in the form of an addendum to the bidding documents.
- B. MATERIAL
 - 1.
 - 2. Pan Type - .042 in. (18 gauge) (1.0mm) or .053 in. (16 gauge) (1.3mm)
 - 3. Panel face sheets shall be made of commercial quality, level, cold-rolled steel conforming to ASTM A 1008 / A 1008M CS Type B and shall have a zinc coating applied by the hot-dip process conforming to ASTM A 653/A653M Commercial Steel (CS), coating designation A60 . The steel shall be free of scale, pitting, coil breaks or other surface blemishes. It shall also be free of buckles, waves or any other defects caused by the use of improperly leveled sheets.
 - 4. For severely corrosive conditions and where shown on the reflected ceiling plan, face sheets and components shall be stainless steel conforming to ASTM A 666, Type 304.
- C. CONSTRUCTION
 - 1. Suspended Metal Pan Ceiling
 - a. Ceiling Pans: Shall be nominally 24" x 24" (609mm x 609mm) (or 24" x 48" (609 x 1219mm)) x 1" 25.4mm) deep with sloping vertical legs on all four sides. All ceiling pans shall be factory formed and may be non-perforated or perforated with .080" (2.03mm) diameter holes on .220" (5.58mm) staggered 45 degree centers or non-perforated.
 - b. When installed, the face of the pans shall rest on the inside surface of the exposed horizontal flanges of the main runner and cross tees. The sloping vertical legs of the pans shall snap-in and lock positively and continuously under the bottom surface of the rectangular bulb of the tee

- sections, and lock into the perimeter channel by a 22 gauge galvanized hold-down clip, thereby providing a visual concealment barrier without the use of exposed clips or fasteners.
- c. Main Runners and Cross Tees: Shall conform to the requirements of a system wide, duty classification in accordance with ASTM C635. They shall be a roll-formed double web with rectangular bulb, using A40 galvaneal steel, minimum .020" (.50mm) thick, to an overall height of 1½" (38.1mm) with a flange width of 15/16" (23.8mm). The cross tee shall provide a positive mechanical lock into the main runners and locking splice. When assembled, the system shall carry performance characteristics in keeping with those necessary to achieve the required seismic rating.
 - d. Hangers: The main runners shall be supported from the structural ceiling by 12 gauge galvanized, pre-stretched, soft annealed, steel wire hung at points not exceeding 48" on center. Hanger wire and wire fasteners are to be provided by ceiling installer and shall meet the required seismic rating.
 - e. Compression Struts: Shall be composed of telescoping ½" (12.7mm) diameter and ¾" (19mm) diameter steel tubing. The ¾" diameter tube shall extend down to rest on the bulb of the main runner. At the other end, a length of ½" diameter tube is to be telescoped into the top portion of the ¾" diameter tube and screw fastened to it with two (2) No.10 x 1 ¼" (31.7mm) screws so the top of the 1/2" diameter tube bears on the structure above and the bottom of the ¾" diameter tube fits snugly upon the bulb of the main runner. A compression strut is required at each hanger wire at a maximum of 48" (1219mm) on center.
 - f. Wall Perimeter Channels: Exposed wall perimeter channel shall be minimum .042" (18 gauge) (1.0 mm) of the same material and have the same finish as the suspension system runners. The perimeter channel shall also be formed into a "C" profile to accommodate a 22 gauge hold-down clip, thereby providing a concealed fastener system. Each hold-down clip shall be locked onto perimeter channel with two spring clips.
 - g. Fasteners: Any exposed fasteners shall be a minimum No.10 size, pin Torx®, tamper-proof security screws. Fasteners for securing the wall moldings to the wall shall be furnished by the ceiling installer and shall meet the required seismic rating.
 - h. Acoustical Material: The inside surface of all perforated ceiling pans shall be covered with a Class "A" black poly-encapsulated fiberglass insulation of sufficient thickness and density to provide the acoustical requirements as outlined in Section 1.05 of this specification.
 - i. MEP Penetrations: All light and air units are to be sized to fit into and trim off full module openings and shall be independently supported from above by the trade requiring the opening.
 - j. Finish: All components of the panel and suspension system visible from the floor side shall have a factory applied finish. Prior to painting, all surfaces shall be cleaned of rust, oil and other impurities by receiving a multi stage pre-treatment consisting of degrease and phosphate coating, clear water rinse and non-chromate sealer and rinse, to condition the surface of the metal to resist and inhibit corrosion and promote paint adhesion. Finish to be applied after perforation to insure coating of the perforated holes. Panels shall be coated with TGIC Polyester or equal, white powder coat, applied at a minimum of 2 mils thickness (dry). The main runners, cross tees, and wall perimeter channels shall be coated with epoxy white powder matching the ceiling panels

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

- A. Protect panels from damage during transit to job storage.
- B. Inspect panels upon delivery for damage. Minor damage may be repaired provided finish items are equal in respect to new work and acceptable to Architect/Engineer. Otherwise, remove and replace with new material.
- C. The detention equipment contractor shall see that materials are properly stored on planks or dunnage in a dry location. Panels shall be stored in a horizontal position and spaced by blocking. Materials shall be covered to protect them from damage but in such a manner as to permit air circulation.

3.02 INSTALLATION

- A. General

1. Install ceiling system using the approved submittal drawings and contract documents. Install using the manufacturer's installation instructions.
 2. Accurately locate partitions, holes, cut outs and verify locations with other trades.
 3. Set closures and steel supports with anchors to suit condition.
 4. Erect true and level with close fitting tolerances.
- B. Fastenings
1. Fasten supporting members to each other and to building construction as detailed or as otherwise required to provide a secure, permanent installation.
 2. Where fastening spacings and sizes are not shown, use spacings and sizings of bolts, screws and welds which will develop the full strength of the members before failure occurs in the fastenings.
- C. Touch-up Painting
1. Immediately after installation, areas where finish coat has been damaged, touch up with finish touch up paint supplied by the manufacturer.

3.03 FIELD QUALITY CONTROL

- A. Hold a meeting with other trades to review installation procedures and workmanship with a special emphasis on unusual conditions to ensure correct installation procedures.
- B. Security panel system shall be installed in place under the supervision of a qualified supervisor, trained and furnished by installer.

END OF SECTION

SECTION 122113
HORIZONTAL LOUVER BLINDS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Horizontal slat louver blinds.
- B. Operating hardware.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating physical and dimensional characteristics.
- C. Samples: Submit two samples, six inch (____ mm) long illustrating slat materials and finish, cord type and color.
- D. Duplicate samples may be required. See section 016000 Product Requirements.
- E. Manufacturer's Installation Instructions: Indicate special procedures.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Product to be delivered to jobsite in manufacturer's original packaging.
- B. Products to be handled and stored to prevent damage to materials, finishes and operating mechanisms. Store in a clean, dry area, laid flat to prevent sagging and twisting of packaging.

1.04 PROJECT SITE CONDITIONS

- A. Building shall be enclosed; and windows, frames and sills shall be installed and glazed.
- B. Wet work shall be complete and dry.
- C. Ceilings, electrical, and mechanical work above window covering shall be complete.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company with prior experience in installing specified products with minimum three years documented experience.

1.06 WARRANTY

- A. Manufacturer Lifetime Warranty against original defects in materials or workmanship.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Horizontal Louver Blinds:
 - 1. Hunter Douglas: www.hunterdouglas.com.
 - 2. Levolor Contract: www.levolorcontract.com.
 - 3. SWFcontract, a division of Spring Window Fashions, LLC.; Bali Classics 1" Aluminum Blinds: www.swfcontract.com.
 - 4. Substitutions: See Section 016000 - Product Requirements.

2.02 HORIZONTAL BLINDS

- A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.
- B. Manual Operation: Cordless control of raising and lowering with full range locking; blade angle adjustable by control wand.
- C. Metal Slats: Spring tempered pre-finished aluminum; radiused slat corners, with manufacturing burrs removed.
 - 1. Width: 1 inch (25 mm).
 - 2. Thickness: 0.006 inch (0.15 mm).
 - 3. Color: match existing.

- D. Head Rail: Pre-finished, formed steel box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; 1" high x 1-1/2" wide x .025" thick U-shaped steel.
 - 1. Color: Same as slats.
- E. Control Wand: clear polycarbonate; hexagonal shape.
 - 1. Removable type with spring clip.
 - 2. Color: Clear.
- F. Accessory Hardware: Type recommended by blind manufacturer.

2.03 FABRICATION

- A. Determine sizes by field measurement.
- B. Fabricate blinds to fit within openings with uniform edge clearance of 1/2 inch (____ mm).
- C. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/2 inch (____ mm) between blinds, located at window mullion centers.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that openings are ready to receive the work.

3.02 INSTALLATION

- A. Install blinds in accordance with manufacturer's instructions including recommended support brackets and fasteners.
- B. Install blinds with adequate clearance to permit smooth operation of the blinds. Demonstrate blinds to be in smooth, uniform working order.

3.03 TOLERANCES

- A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch (6 mm).
- B. Maximum Offset From Level: 1/8 inch (3 mm).

3.04 ADJUSTING

- A. Adjust blinds for smooth operation.

3.05 CLEANING

- A. Clean blind surfaces just prior to occupancy. Clean per Manufacturer recommendations.

END OF SECTION

SECTION 133419
METAL BUILDING SYSTEMS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Manufacturer-engineered, shop-fabricated structural steel building frame.
- B. Metal wall and roof panels including soffits and gutters and downspouts.
- C. Exterior Wall Insulation
- D. Exterior doors, windows, skylights, overhead doors, and louvers.

1.02 REFERENCE STANDARDS

- A. AISC 360 - Specification for Structural Steel Buildings; 2022, with Errata (2025).
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- G. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2019.
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- I. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2025.
- J. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.
- K. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- L. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.
- M. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.
- N. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.
- O. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- P. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- Q. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2024.
- R. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
- S. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.
- B. Comply with applicable code for size and method of rain water discharge.
 - 1. Size: 4x6 Minimum.

2. Manufacturer to verify downspouts and gutters are sized in relation to the flow rate for the region the project is located in and in accordance with the International Plumbing Code.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on profiles, component dimensions, fasteners.
- C. Shop Drawings: Indicate assembly dimensions including field dimensions of existing building components to insure proper alignment of new building, provide locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation; framing anchor bolt settings, sizes, and locations from datum, foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.
- D. Samples: Submit two samples of precoated metal panels for each color selected, 2x4 inch (____by____ mm) in size illustrating color and texture of finish.
- E. Duplicate samples may be required. See section 016000 Product Requirements.
- F. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement.
- G. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.
- H. Certification:
 1. Submit written certification prepared, signed and sealed by a Professional Engineer, licensed and registered to practice in the State of Mississippi, verifying the building design meets requirements of adopted building code, before fabrication and/or delivery of materials to project site.
 2. Provide certification that roof system has been tested and listed by Underwriters Laboratories, Inc. to have a Wind Uplift Classification of Class 90.
- I. Manufacturer's Qualification Statement: Provide documentation showing metal building manufacturer is accredited under IAS AC472.
 1. Include statement that manufacturer designs and fabricates metal building system as integrated components and assemblies, including but not limited to primary structural members, secondary members, joints, roof, and wall cladding components specifically designed to support and transfer loads and properly assembled components form a complete or partial building shell.
- J. Project Record Documents: Record actual locations of concealed components and utilities.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this type of work.
 1. Design Engineer Qualifications: Licensed in the State in which the Project is located.
 2. Comply with applicable code for submission of design calculations as required for acquiring permits.
 3. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.
- B. All work shown on these documents are intended as a guide only. The contractor shall be responsible for producing complete signed and stamped shop drawings and calculations for review.
- C. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
 1. Not less than 10 years of documented experience
- D. Erector Qualifications: Company specializing in performing the work of this section approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store all components so they will not be damaged or deformed.
- B. Stack all materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store all metal sheets or panel components in order for water accumulations to drain

freely. Do not store sheets or panels in contact with other materials which might cause staining. Do NOT store materials on the ground.

- C. Protect materials and finish during storage, handling, and installation to prevent damage.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide 20 year manufacturer warranty for wall, roof, and soffit panel finish.
 - 1. Include coverage for exterior pre-finished surfaces to cover pre-finished color coat against chipping, cracking or crazing, blistering, peeling, chalking, or fading. Include coverage for weather tightness of building enclosure elements after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Buildings Systems:
 - 1. Butler Manufacturing Company: www.butlermfg.com.
 - 2. Ceco Building Systems: www.cecobuildings.com.
 - 3. Chief Buildings; www.chiefbuildings.com: www.chiefbuildings.com/#sle.
 - 4. ACI Building Systems: www.acibuildingsystems.com.
 - 5. VP Buildings: www.vp.com.
 - 6. Whirlwind Steel Buildings: www.whirlwindsteel.com.
 - 7. Pinnacle Structures: www.pinnaclestructures.com.
 - 8. No Substitutions

2.02 ASSEMBLIES

- A. Single span rigid frame.
- B. Primary Framing: Rigid frame of rafter beams and straight columns, canopy beams and end wall columns, and wind bracing.
- C. Secondary Framing: Purlins, and other items detailed.
- D. Wall System: Preformed metal panels of horizontal profile, with sub-girt framing/anchorage assembly, insulation, and liner sheets, and accessory components.
- E. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly, insulation, and liner panels, and accessory components.
- F. Roof Slope: As indicated on the drawings.

2.03 PERFORMANCE REQUIREMENTS

- A. Installed Thermal Resistance of Wall System: R-value of 13 (RSI-value of ____).
- B. Installed Thermal Resistance of Roof System: R-value of 30 (RSI-value of ____).
- C. Design structural members to withstand dead load, and design loads due to pressure and suction of wind calculated in accordance with ASCE 7-16 code and as called for on the drawings. Whichever is most stringent governs.
- D. Design structural members to withstand Class 90 wind uplift in accordance with UL 580.
- E. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.
- F. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of ____ degrees F (____ degrees C).
- G. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

2.04 MATERIALS - FRAMING

- A. Structural Steel Members: ASTM A36/A36M.
- B. Structural Tubing: ASTM A500/A500M Grade B cold-formed.

- C. Plate or Bar Stock: ASTM A529/A529M, Grade 50.
- D. Anchor Bolts: ASTM F1554, Grade 36, Class 1A, with no preference for protective coating.
- E. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1; galvanized to ASTM A153/A153M.
- F. Welding Materials: Perform in accordance with AWS D1.1/D1.1M.
- G. Primer: SSPC-Paint 20 zinc rich.
- H. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch (13.7 MPa).
 - 2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch (48 MPa).

2.05 MATERIALS - WALLS AND ROOF

- A. Steel Sheet: ASTM A792/A792M aluminum-zinc alloy coated to AZ50/AZM150.
- B. Insulation: ASTM C665 Type I; 4 inches (____ mm) thick.
 - 1. Facing: Sheet vinyl, .004 inch thick, white.
- C. Joint Seal Gaskets: Manufacturer's standard type.
- D. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A153/A153M, finish to match adjacent surfaces when exterior exposed.
- E. Bituminous Paint: Asphaltic type. For use as a dissimilar metal separation or as a separation when attaching members to concrete or CMU substrate.
- F. Sealant: ASTM C920, elastomeric sealant with movement capability of at least plus/minus 50 percent; 100 percent silicone; for exposed applications, match adjacent colors as closely as possible.
- G. Metal Mesh: Galvanized steel wire, woven.
- H. Trim, Closure Pieces, Caps, Flashings, Gutters, Downspouts, Rain Water Diverter, Fascias, and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2.06 COMPONENTS

- A. Doors and Frames: See Section 081113.
- B. Rod Mounted Door Canopies: Manufacturer's standard framed as required for hurricane rating, finish to match wall and roof panels. PEMB supplier shall provide blocking and supports as necessary.
 - 1. See Specification Section 107313.

2.07 DESIGN CRITERIA

- A. Installed Thermal Resistance of Wall System: R-value of R-13 (RSI-value of ____).
- B. Installed Thermal Resistance of Roof System: R-value of R-30 (RSI-value of ____).
- C. Design members to withstand dead load, and design loads due to pressure and suction of wind calculated in accordance with applicable code.
- D. Design members to withstand UL 580 Uplift Class 90.
- E. Permit movement of roofing components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature difference between interior structural framework and exterior of plus or minus 100 degrees F (____ degrees C).

2.08 FABRICATION - FRAMING

- A. Fabricate members in accordance with AISC 360 for plate, bar, tube, or rolled structural shapes.
- B. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.
- C. Provide wall opening framing for doors and other accessory components.

2.09 FABRICATION - WALL AND ROOF PANELS

- A. Exterior and Interior Wall Panels: Minimum 26 gauge .025 inch (____ mm) metal thickness, <> profile indicated, 1-1/4" inch (____ mm) deep, lapped edges fitted with continuous gaskets.
- B. Exterior Wall Panels:

1. Profile: Equal to MBCI PBR Panel
 2. Gauge: Minimum 26
 3. Width: 36 inches
 4. Finish: Smooth Finish
 5. Coating: Equal to MBCI Signature 300. Color to be chosen by architect from manufacturer's standard colors.
- C. Roof Panels:
1. Profile: Equal to MBCI SUPERLOK
 2. Gauge: Minimum 24
 3. Width: 16 inches
 4. Finish: Striated
 5. Coating: Equal to MBCI Signature 300. Color to be chosen by architect from manufacturer's standard colors.
- D. Girts/Purlins: Rolled formed structural shape to receive siding, roofing and liner sheet.
- E. Internal and External Corners: Same material thickness and finish as adjacent material, profile brake formed to required angles. Back brace mitered internal corners with .020 inch thick sheet.
- F. Expansion Joints: Same material and finish as adjacent material where exposed, .020 inch thick, manufacturer's standard brake formed type, of profile to suit system.
- G. Flashings, Closure Pieces, Fascia: Same material and finish as adjacent material, profile to suit system.
- H. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

2.10 FABRICATION - GUTTERS AND DOWNSPOUTS

- A. Fabricate of same material and finish as roofing metal.
- B. Form gutters and downspouts and scuppers of square profile and size indicated to collect and remove water. Fabricate with connection pieces.
- C. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.
- D. Fabricate support straps of same material and finish as roofing metal, color as selected.
- E. Size: Manufacturer to verify downspouts and gutters are sized in relation to the flow rate for the region the project is located in; and in accordance with the International Plumbing Code.

2.11 FINISHES

- A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.
- B. Exterior Surfaces of Wall and Roof Components and Accessories: Precoated enamel on steel of Polyvinylidene Difluoride (PVDF) finish, <> color as selected from manufacturer's standard range.
- C. Interior Surfaces of Roof Components and Accessories: Precoated enamel on steel of modified silicone finish, <> color as selected from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.02 ERECTION - FRAMING

- A. Erect framing in accordance with AISC 360.
- B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.
- C. Set column base plates with non-shrink grout to achieve full plate bearing.
- D. Do not field cut or alter structural members without approval.
- E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 ERECTION - WALL AND ROOF PANELS

- A. Install in accordance with manufacturer's instructions.
- B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.
- C. Fasten cladding system to structural supports, aligned level and plumb.
- D. Locate end laps over supports. End laps minimum 2 inches (50 mm). Place side laps over bearing.
- E. Provide expansion joints where indicated.
- F. Use concealed fasteners.
- G. Install sealant and gaskets, providing weather tight installation. Field applied tape sealant or manufactured equivalent is required at all panel sidelaps and endlaps.

3.04 ERECTION - GUTTERS AND DOWNSPOUTS

- A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.
- B. Apply bituminous paint on surfaces in contact with cementitious materials.
- C. Slope gutters minimum 1/16" inch/ft (____ mm/m).
- D. Install concrete splash pans under each downspout.

3.05 TOLERANCES

- A. Framing Members: 1/4 inch (6 mm) from level; 1/8 inch (3 mm) from plumb.
- B. Siding and Roofing: 1/8 inch (3 mm) from true position.

END OF SECTION

SECTION 142100
ELECTRIC TRACTION ELEVATORS**PART 1: GENERAL****1.01 SUMMARY**

- A. Section Includes: Electric Traction Elevators.
- B. Products Supplied but Not Installed Under this Section:
 - 1. Hoist Beam
 - 2. Pit Ladder
 - 3. Inserts mounted in block walls for rail attachments
- C. Work Supplied Under Other Sections:
 - 1. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.
 - 2. Main line disconnects for each elevator.
 - a. One fused three phase permanent power in building electrical distribution room
 - 3. Hoistway ventilation shall be in accordance with local and national building code requirements.
 - 4. Guide Rail Support shall be structurally adequate to extend from pit floor to top of hoistway, with spans in accordance with requirements of authority having jurisdiction and final layouts.
 - 5. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.
 - 6. Lifeline attachments capable of withstanding 5000 lb load in accordance with OSHA 29 CFR 1926.502. Provide a minimum of 2 at the top, front of each hoistway.
 - 7. Pit lighting: Fixture with switch and guards. Provide illumination level equal to or greater than that required by ASME A17.1/CSA B44 2000, or applicable version.
 - 8. Control space lighting with switch. Coordinate switch with lighting for machine space as allowable by code.
 - 9. Access Doors: As required for access to governor and/or seismic switch. Access door shall be self-closing, self-locking if necessary and operable from the inside without a key.
- D. Industry and government standards:
 - 1. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
 - 2. ADAAG - Accessibility Guidelines for Buildings and Facilities
 - 3. ANSI/NFPA 70, National Electrical Code
 - 4. ANSI/NFPA 80, Standard for Fire Doors and Fire Windows
 - 5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.

1.02 DESCRIPTION OF ELEVATOR

- A. Elevator Equipment: MonoSpace® 300 gearless traction elevator
- B. Equipment Control: KCM831
- C. Drive: Non Regenerative
- D. Quantity of Elevators: 1 Elevator
- E. Landings: 2
- F. Openings: 2 Front Openings, 2 Back Openings
- G. Main Power Supply: 480 V Volts + 5%, three-phase
- H. Operation: Simplex
- I. Machine Location: Inside the hoistway mounted on car guide rail
- J. Control Space Location: Integrated control
- K. Elevator Equipment shall conform to the requirements of seismic zone: Non-Seismic
- L. Maintenance Service Period: 12 Months

1.03 PERFORMANCE REQUIREMENTS

- A. Car Performance
 - 1. Car Speed $\pm 5\%$ of contract speed under any loading condition or direction of travel.
 - 2. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.
- B. System Performance
 - 1. Vertical Vibration (maximum): ISO 18738/ISO 8041 system pk-pk 15 mg
 - 2. Horizontal Vibration (maximum): ISO 18738/ISO 8041 system pk-pk 12 mg
 - 3. Jerk Rate (maximum): 1 m/s³
 - 4. Acceleration (maximum): 0.4 m/s²
 - 5. In Car Noise: 55 dB(A) Maximum
 - 6. Leveling Accuracy: ± 0.2 inches
 - 7. Starts per hour (maximum): 180

1.04 SUBMITTALS

- A. Comply with Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit manufacturer's product literature for each proposed system.
 - 1. Cab design, dimensions and layout.
 - 2. Layout, finishes, and accessories and available options.
 - 3. Controls, signals and operating system.
 - 4. Color selection charts for cab and entrances.
- C. Shop Drawings:
 - 1. Clearances and travel of car.
 - 2. Clear inside hoistway and pit dimensions.
 - 3. Location and layout of equipment and signals.
 - 4. Car, guide rails, buffers and other components in hoistway.
 - 5. Maximum rail bracket spacing.
 - 6. Maximum loads imposed on building structure.
 - 7. Hoist beam requirements.
 - 8. Location and sizes of access doors.
 - 9. Location and details of hoistway door and frames.
 - 10. Electrical characteristics and connection requirements.
 - a. Access control Interface accommodation and coordination approach.
- D. Operation and maintenance data:
 - 1. Provide manufacturer's standard maintenance and operation manual.
- E. Diagnostic Tools
 - 1. Prior to seeking final acceptance for the completed project as specified by the Contract Documents, the Elevator Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform diagnostic evaluations, adjustments, and/or parametric software changes and/or test and inspections on any piece of control or monitoring equipment installed.
 - a. This shall include any specialized tool(s) required for monitoring, inspection and/or maintenance where the means of suspension other than conventional wire ropes are furnished and installed by the Elevator Contractor. Any and all such tool(s) shall become property of the Owner. Any diagnostic tool provided to the Owner by the Elevator Contractor shall be configured to perform all levels of diagnostics, systems adjustment and parametric software changes which are available to the Elevator Contractor.
 - b. In those cases where diagnostic tools provided to the Owner require periodic recalibration/or re-initiation, the Elevator Contractor shall perform such tasks at no additional cost to the Owner for a period equal to the term of the maintenance agreement from the date of final acceptance of the completed project. During those intervals in which the Owner might find it necessary to surrender a diagnostic tool for re-calibration, re-initiation, or repair, the Elevator Contractor shall provide a temporary replacement for the tool at no additional cost to the Owner.
 - c. The Elevator Contractor shall deliver to the Owner, printed instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, system adjustment, and/or

parametric software changes on any unit of microprocessor-based elevator control equipment and means of suspension other than standard elevator steel cables furnished and install by the Elevator Contractor.

- d. Accompanying the printed instructions shall be any and all access codes, password, or other proprietary information that is necessary to interface with the microprocessor-control equipment.

1.05 QUALITY ASSURANCE

- A. Manufacturer: Minimum of fifteen years' experience in the fabrication, installation and service of elevators of the type and performance of the specified. The manufacturer shall have a documented quality assurance program.
- B. Installer: The equipment manufacturer shall install the elevator.
- C. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests.
- D. The General Contractor is solely responsible for coordinating with the elevator manufacturer during the bidding process to ensure all elements required for a complete and code-compliant elevator installation are provided, regardless of what is shown in the structural, electrical, or architectural drawings. This includes, but is not limited to, rail supports, tracks, beams, pit framing, shaft structure, clearance for controls, and any other additional required components including life safety features. If the required items are not brought to the architect's attention during the bidding phase, then the general contractor will be required to provide all additional elements at no cost to the owner.

1.06 DELIVERY, STORAGE AND HANDLING

- A. If the construction site is not prepared to receive the elevator equipment at the agreed ship date, the General Contractor shall be responsible for the cost of storage at an approved facility. Additional labor costs for double handling will be the responsibility of the General Contractor.
- B. Delivered elevator materials shall be stored in a protected environment in accordance with manufacturer recommendations. A minimum storage area of 10 feet by 20 feet is required adjacent to the hoistway.

1.07 WARRANTY

- A. Provide manufacturer warranty for a period of one year. The warranty period is to begin upon final acceptance of the Contract. Warranty covers defects in materials and workmanship. Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect do not constitute defective material or workmanship.

1.08 MAINTENANCE SERVICE

- A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of 12 Months after date of final acceptance. Predictive maintenance shall be included for the full maintenance period. This service must be capable of using AI-based analytics to identify potential equipment issues and notifying the elevator provider via an internet connection. Replacement parts shall be produced by the original equipment manufacturer.
- B. Maintenance service to be performed during regular working hours of regular working days and shall include emergency call back service during regular working hours.
- C. Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.

PART 2: PRODUCTS

2.01 MANUFACTURER

- A. Provide AC gearless machine room-less elevator systems subject to compliance with the design and performance requirements of this specification. Elevator manufacturers may include but are not limited to one of the following:
 - 1. Basis of Design: MonoSpace® 300 traction elevators by KONE, Inc. (www.kone.com).
 - 2. Other acceptable machine room-less products: manufacturer with minimum 15 years' experience in manufacturing, installing, and servicing elevators of the type required for the project.

2.02 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

- A. Controller: Provide microcomputer-based control system to perform all functions.
 - 1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
 - 2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.
 - 3. Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.
 - 4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.
- B. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.
- C. Controller Location: Locate controller{s} in the front wall integrated with the top landing entrance frame, machine side of the elevator. One non-fused three phase permanent power in hoist way at top landing. A separate control space should not be required.

2.03 EQUIPMENT: HOISTWAY COMPONENTS

- A. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway
- B. Hoisting: Elevator must utilize traditional steel hoist cables that do not require a monitoring device.
- C. Governor: Friction type over-speed governor rated for the duty of the elevator specified.
- D. Buffers, Car and Counterweight: Polyurethane buffer.
- E. Hoistway Operating Devices:
 - 1. Emergency stop switch in the pit
 - 2. Terminal stopping switches.
 - 3. Emergency stop switch on the machine
- F. Positioning System: System consisting of magnets and proximity switches.
- G. Guide Rails and Attachments: Steel rails with brackets and fasteners.

2.04 EQUIPMENT: HOISTWAY ENTRANCES

- A. Hoistway Entrances
 - 1. Sills: Extruded Aluminum.
 - 2. Doors: Hollow metal construction with vertical internal channel reinforcements.
 - 3. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hour.
 - 4. Entrance Finish: Brushed Stainless Steel.
 - 5. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

2.05 EQUIPMENT: CAR COMPONENTS

- A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.
- B. Car Safeties: Device will be provided and mounted under the car platform, securely bolted to the Car Frame. The safety will be actuated by a centrifugal governor mounted at the top of the hoistway. The Safety is designed to operate in case the car attains excessive descending speed.
- C. Platform: Platform shall be all steel construction.
- D. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
- E. Car Wall Finish:
 - 1. Side Walls: 304 Brushed Stainless Steel (4SS)
 - 2. Rear Wall: 441 Brushed Stainless Steel (4SS)
 - 3. Car front, Door and Skirting: Brushed Stainless Steel

4. Ceiling: Round, LED spotlights
 5. Handrails: Brushed Stainless Steel
 - a. Rails to be located on of car enclosure.
 6. Sills: Aluminum extruded.
- F. Cab Wall Protection Pads to be included
- G. Flooring: By others. (Not to exceed 3lb/sqft and 1/2" finished depth.)
- H. Emergency Car Signals
1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.
 2. Emergency Car Lighting: Provide emergency power unit employing a 12- volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
 3. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.
- I. Ventilation: Manufacturer's standard cab fan

2.06 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation. Fixture finish to be Brushed Stainless Steel
1. Main Flush mounted car operating panel shall contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons have Amber Dot Matrix illumination (halo). All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be Amber Dot Matrix. All texts, when illuminated, shall be Amber Dot Matrix. The car operating panel shall have a Brushed Stainless Steel finish.
 2. Additional features of car operating panel shall include:
 - a. Car Position Indicator within operating panel Brushed Stainless Steel
 - b. Elevator Data Plate marked with elevator capacity and car number on car top.
 - c. Help buttons with raised markings.
 - d. In car stop switch per local code.
 - e. Call Cancel Button.
- B. Hall Fixtures: hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. hall fixtures shall have a Brushed Stainless Steel finish.
1. Vandal Resistant hall fixtures shall feature round, mechanical, buttons in applied mount face frame. Hall fixtures shall correspond to options available from that landing. Buttons shall be in a vertically mounted fixture.
- C. Hall Lanterns and Chime: A directional lantern visible from the corridor shall be provided at each hall entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel, and a chime will sound. The chime will sound once for up and twice for down. The hall lantern face plate shall have a Brushed Stainless Steel finish.

2.07 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

- A. Elevator Operation
1. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
 2. Card reader logic for Access control. Card reader material and install by others.
 3. Zoned Car Parking.
 4. Relative System Response Dispatching.
- B. Standard Operating Features to include:
1. Full Collective Operation
 2. Fan and Light Control.

3. Load Weighing Bypass.
 4. Ascending Car Uncontrolled Movement Protection
 5. Top of Car Inspection Station.
- C. Additional Operating Features to include:
1. Independent Service.
 2. Hoistway Access Bottom Landing.
 3. Hoistway Access Top Landing.
 4. Car Wall Protection Pads
 5. Standby Power
 - a. See Construction Documents for Standby By power supply source.
- D. Emergency Video Communication, if required by code. The video display screen will come with multi-media content during the warranty maintenance period.
- E. Elevator Control System for Inspections and Emergency
1. Provide devices within controller to run the elevator in inspection operation.
 2. Provide devices on car top to run the elevator in inspection operation.
 3. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
 4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.
 5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
 6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
 7. Provide the means for the control to reset elevator earthquake operation.

2.08 EQUIPMENT: DOOR OPERATOR AND CONTROL

- A. Door Operator: A closed loop permanent magnet VVVF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.
- B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.
- C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.
- D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.
- E. Electronic Door Safety Device. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

PART 3: EXECUTION

3.01 EXAMINATION

- A. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.

- B. Do not proceed with work until unsatisfactory conditions are corrected.
- C. Prior to start of work, verify hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work of this section until dimensions are within tolerances.
- D. Prior to start of work, verify projections greater than two inches (four inches if ASME A17.1/CSA B44 2000 applies) must be beveled not less than 75 degrees from horizontal.
- E. Prior to start of work, verify landings have been prepared for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.
- F. Prior to start of work, verify elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.
- G. Prior to start of work, verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including sleeves and penetrations.
- H. Verify installation of GFCI protected 20-amp in pit and adjacent to each signal control cabinet in control space.

3.02 PREPARATION

- A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.03 INSTALLATION

- A. Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.
- B. Properly locate guide rails and related supports at locations in accordance with manufacturer's recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration to structure.
- C. All hoistway frames shall be securely fastened to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades.
- D. Lubricate operating system components in accordance with manufacturer recommendations.
- E. Perform final adjustments, and necessary service prior to final acceptance.

3.04 CONSTRUCTION

- A. Interface with Other Work:
 - 1. Guide rail brackets attached to steel shall be installed prior to application of fireproofing.
 - 2. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.
 - 3. Ensure adequate support for entrance attachment points at all landings.
 - 4. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.
 - 5. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.
 - 6. Coordinate interface of elevators and fire alarm system.
 - 7. Coordinate interface of dedicated telephone line.
 - 8. Coordinate card reader logic with Access Control System and door control series.

3.05 TESTING AND INSPECTIONS

- A. Perform recommended and required testing in accordance with authority having jurisdiction
- B. Obtain required permits and provide originals to Owner's Representative.

3.06 DEMONSTRATION

- A. Prior to final acceptance, instruct Owner's Representative on the proper function and required daily maintenance of elevators. Instruct personnel on emergency procedures.

END OF SECTION

SECTION 210500
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Pipe, fittings, sleeves, escutcheons, seals, and connections for sprinkler systems.

1.02 REFERENCE STANDARDS

- A. ASME A112.18.1 - Plumbing Supply Fittings; 2024.
- B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2025.
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
- D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- E. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.
- F. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard; 2025.
- G. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded; 2021.
- H. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- J. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2021.
- K. ASTM A536 - Standard Specification for Ductile Iron Castings; 2024.
- L. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.
- M. AWWA C606 - Grooved and Shouldered Joints; 2022.
- N. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.
- C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- D. Project Record Documents: Record actual locations of components and tag numbering.
- E. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified this section.
 - 1. Minimum three years experience.
- C. Conform to UL requirements.
- D. Valves: Bear UL and FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- E. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.
- F. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS**2.01 FIRE PROTECTION SYSTEMS**

- A. Sprinkler Systems: Comply with NFPA 13.

2.02 BURIED PIPING

- A. AWWAA C900 PVC

2.03 ABOVE GROUND PIPING

- A. Steel Pipe: ASTM A53 Schedule 40 or ASTM A135/A135M Schedule 10, black.
 - 1. Steel Fittings: ASME B16.5, steel flanges and fittings or ASME B16.11, forged steel socket welded and threaded.
 - 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
 - 3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
 - 4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.04 PIPE SLEEVES

- A. Vertical Piping:
 - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
 - 2. Provide sealant for watertight joint.
 - 3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
 - 4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.
- B. Plastic, Sheet Metal, or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Pipe Passing Through Quarry Tile, Terrazzo, or Ceramic Tile Floors:
 - 1. Brass pipe.
 - 2. Connect sleeve with floor plate.
- D. Pipe Passing Through Mechanical Room Floors:
 - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
 - 2. Connect sleeve with floor plate except in mechanical rooms.
- E. Clearances:
 - 1. Wall, Floor, Floor, and Partitions: 1 inch (25 mm) greater than external; pipe diameter.
 - 2. Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.05 MANUFACTURED SLEEVE-SEAL SYSTEMS

- A. Manufacturers:
 - 1. Advance Products & Systems, Inc: www.apsonline.com.
 - 2. The Metraflex Company: www.metraflex.com.com.
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Modular/Mechanical Seal:

1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
2. Provide watertight seal between pipe and wall/casing opening.
3. Elastomer element size and material in accordance with manufacturer's recommendations.
4. Glass reinforced plastic pressure end plates.

2.06 ESCUTCHEONS

- A. Manufacturers:
1. Fire Protection Products, Inc: www.fppi.com.com.
 2. Tyco Fire Protection Products: www.tyco-fire.com.
 3. Viking Group Inc: www.vikinggroupinc.com.
 4. Substitutions: See Section 016000 - Product Requirements.
 5. Fabricate from nonferrous metal.
 6. Metals and Finish: Comply with ASME A112.18.1.
 7. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.07 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Malleable iron, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hook.
- E. Wall Support for Pipe Sizes 4 inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
- F. Vertical Support: Steel riser clamp.
- G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.08 MECHANICAL COUPLINGS

- A. Manufacturers:
1. Victaulic Company: www.victaulic.com.
 2. Substitutions: See Section 016000 - Product Requirements.
 3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
 4. Bolts and Nuts: Hot dipped galvanized or zinc electroplated steel.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Inserts:
1. Provide inserts for placement in concrete formwork.
 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
 6. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 7. Place hangers within 12 inches (300 mm) of each horizontal elbow.

8. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 9. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 10. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- B. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- C. Structural Considerations:
- D. Provide sleeves when penetrating footings, floors, walls, and partitions and seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
 2. Aboveground Piping:
 - a. Pack solid using mineral fiber complying with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
 3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
 4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
 5. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 6. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
 7. Locate piping in center of sleeve or penetration.
 8. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
 9. Tighten bolting for a water-tight seal.
 10. Install in accordance with manufacturer's recommendations.
 11. Install and firmly attach escutcheons at piping penetrations into finished spaces.
 12. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
 13. Attach plates at the underside only of suspended ceilings.
 14. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.
- E. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- F. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

3.03 CLEANING

END OF SECTION

SECTION 210523
GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Check valves.
- B. Bronze OS&Y gate valves.
- C. Iron OS&Y gate valves.
- D. Trim and drain valves.

1.02 ABBREVIATIONS AND ACRONYMS

- A. NRS: Non-rising stem.
- B. OS&Y: Outside screw and yoke.
- C. PTFE: Polytetrafluoroethylene.

1.03 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
- C. ASME B31.9 - Building Services Piping; 2025.
- D. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2025.
- E. AWWA C606 - Grooved and Shouldered Joints; 2022.
- F. FM (AG) - FM Approval Guide; Current Edition.
- G. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL (DIR) - Online Certifications Directory; Current Edition.
- I. UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- J. UL 312 - Check Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- K. UL 789 - Indicator Posts for Fire-Protection Service; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Obtain valves for each valve type from single manufacturer.
 - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Where listed products are specified, provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), FM Global, or testing firm acceptable to authorities having jurisdiction as suitable for the purpose indicated.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX.

D. Installer Qualifications:

1. Company specializing in performing the work of this section with minimum five years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and weld ends.
3. Set valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.
2. Store valves in shipping containers and maintain in place until installation.
 - a. Store valves indoors and maintain at higher than ambient dew point temperature.
 - b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.

C. Use the following precautions for handling:

1. Use sling to handle large valves, rigged to avoid damage to exposed parts.
2. Do not use operating handles or stems as lifting or rigging points.

PART 2 PRODUCTS**2.01 GENERAL REQUIREMENTS**

A. UL Listed: Provide valves listed in UL (DIR) under following headings and bearing UL mark:

1. Main Level: HAMV - Fire Main Equipment.
 - a. Level 1: HCBZ - Indicator Posts, Gate Valve.
 - b. Level 1: HLOT - Valves.
 - c. Level 3: HMER - Check Valves.
 - d. Level 3: HMRZ - Gate Valves.
2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.
 - a. Level 1: VQGU - Valves, Trim, and Drain.

B. FM Global Approved: Provide valves listed in FM (AG) Approval Guide under the following headings:

1. Automated Sprinkler Systems:
 - a. Indicator posts.
 - b. Valves:
 - 1) Gate valves.
 - 2) Single check valves.
 - 3) Miscellaneous valves.

C. ASME Compliance:

1. ASME B16.1 for flanges on iron valves.
2. ASME B1.20.1 for threads on threaded-end valves.
3. ASME B31.9 for building services piping valves.

D. Comply with AWWA C606 for grooved-end connections.

E. Comply with NFPA 13 for valves.

F. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Actuator Types:

1. Handwheel: For other than quarter-turn trim and drain valves.
2. Hand-lever: For quarter-turn trim and drain valves 2 NPS (50 DN) and smaller.

2.02 CHECK VALVES

A. UL 312 and FM (AG) standard listing for check valves, Class Number 1045.

- B. Minimum Pressure Rating: 175 psig (1200 kPa).
- C. Type: Center guided check valve.
- D. Body Material: Cast iron, ductile iron.
- E. Center guided check with elastomeric seal.
- F. Hinge Spring: Stainless steel.
- G. End Connections: Flanged, grooved, or threaded.

2.03 BRONZE OS&Y GATE VALVES

- A. UL 262 and FM (AG) standard listing for fire-service water control valves (OS&Y and NRS-type gate valves).
- B. Minimum Pressure Rating: 175 psig (1200 kPa).
- C. Body and Bonnet Material: Bronze or brass.
- D. Wedge: One-piece bronze or brass.
- E. Wedge Seat: Bronze.
- F. Stem: Bronze or brass.
- G. Packing: Non-asbestos PTFE.
- H. Supervisory Switch: External.
- I. End Connections: Threaded.

2.04 IRON OS&Y GATE VALVES

- A. UL 262 and FM (AG) standard listing for fire-service water control valves (OS&Y and NRS-type gate valves).
- B. Minimum Pressure Rating: 175 psig (1200 kPa).
- C. Body and Bonnet Material: Cast or ductile iron.
- D. Wedge: Cast or ductile iron, or bronze with elastomeric coating.
- E. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.
- F. Stem: Brass or bronze.
- G. Packing: Non-asbestos PTFE.
- H. Supervisory Switch: External.
- I. End Connections: Flanged.

2.05 TRIM AND DRAIN VALVES

- A. Ball Valves:
 - 1. Description:
 - a. Pressure Rating: 175 psig (1200 kPa).
 - b. Body Design: Two piece.
 - c. Body Material: Forged brass or bronze.
 - d. Port Size: Full or standard.
 - e. Seat: PTFE.
 - f. Stem: Bronze or stainless steel.
 - g. Ball: Chrome-plated brass.
 - h. Actuator: Hand-lever.
 - i. End Connections for Valves 1 NPS (25 DN) through 2-1/2 NPS (65 DN): Threaded ends.
- B. Angle Valves:
 - 1. Description:
 - a. Pressure Rating: 175 psig (1200 kPa).
 - b. Body Material: Brass or bronze.

- c. Ends: Threaded.
- d. Stem: Bronze.
- e. Disc: Bronze.
- f. Packing: Asbestos free.
- g. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Confirm valve interior to be free of foreign matter and corrosion.
- B. Remove packing materials.
- C. Examine guides and seats by operating valves from the fully open position to the fully closed position.
- D. Examine valve threads and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage.
 - 1. Check bolting for proper size, length, and material.
 - 2. Verify gasket for size, defects, damage, and suitable material composition for service.
 - 3. Replace all defective valves with new valves.

3.02 INSTALLATION

- A. Comply with specific valve installation requirements and application in the following Sections:
 - 1. Section 211300 for application of valves in wet and dry pipe, fire-suppression sprinkler systems.
- B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.
 - 1. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in water supply connections and backflow preventer at potable water supply connections.
- D. Valves with threaded connections to have unions at equipment arranged for easy access, service, maintenance, and equipment removal without system shutdown.
- E. Valves in horizontal piping installed with stem at or above the pipe center.
- F. Position valves to allow full stem movement.
- G. Install valve tags. Comply with Section 210553 requirements for valve tags, schedules, and signs on surfaces concealing valves; and the appropriate NFPA standard applying to the piping system in which valves are installed.

END OF SECTION

SECTION 210553
IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Tags.
- B. Pipe markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation instructions.
- E. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS**2.01 IDENTIFICATION APPLICATIONS**

- A. Instrumentation: Tags.
- B. Piping: Pipe markers.
- C. Small-sized Equipment: Tags.
- D. Valves: Tags.

2.02 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com.
 - 2. Brady Corporation: www.bradycorp.com.
 - 3. Brimar Industries, Inc.: www.pipemarker.com.
 - 4. Kolbi Pipe Marker Company.: www.kolbipipemarkers.com.
 - 5. Seton Identification Products, a Tricor Direct Company: www.seton.com.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.03 PIPE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com.
 - 2. Brimar Industries, Inc.: www.pipemarker.com.
 - 3. Kolbi Pipe Marker Company.: www.kolbipipemarkers.com.
 - 4. MIFAB, Inc.: www.mifab.com.
 - 5. Seton Identification Products, a Tricor Company: www.seton.com.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Color: Comply with ASME A13.1.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.

- E. Color code as follows:
 - 1. Fire Quenching Fluids: Red with white letters.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install tags with corrosion resistant chain.
- B. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- C. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- D. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
- E. Identify service, flow direction, and pressure.
- F. Install in clear view and align with axis of piping.
- G. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 211100
FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Water pipe.
- B. Valves.
- C. Fire department connections.
- D. Private fire hydrants.
- E. Bedding and cover materials.
- F. Accessories.

1.02 REFERENCE STANDARDS

- A. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications; 2022.
- B. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.
- C. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 2019 (Reapproved 2025).
- D. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.
- E. AWWA C502 - Dry-Barrel Fire Hydrants; 2024.
- F. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances; 2023.
- G. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings; 2021.
- H. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1500 mm); 2022.
- I. AWWA M23 - PVC Pipe—Design and Installation; 2020.
- J. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of fire service with size, location and installation of service utilities.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Include data on pipe materials, pipe fittings, valves, and accessories.
 - 2. Provide manufacturer's catalog information.
 - 3. Indicate valve data and ratings.
 - 4. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.
- C. Project Record Documents:
 - 1. Record actual locations of piping mains, valves, connections, fire hydrants, free-standing fire department connections, underground manholes and vaults, valve boxes, thrust restraints, and invert elevations.
 - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- D. Maintenance Data: Include installation instructions, spare parts lists, and exploded assembly views.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years experience.
- C. Provide grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.
- D. Date stamp castings used for coupling housings, fittings, and valve bodies for quality assurance and traceability.
- E. Valves: Bearing product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- F. Products:
 - 1. Listed, classified, and labeled as suitable for the purpose specified and indicated.
 - 2. Refer to UL (FPSD) and FM Approval Guide.
- G. Perform Work in accordance with Local Authority Having Jurisdiction, local municipality, and local water utility requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS**2.01 WATER PIPE**

- A. PVC Pipe: Listed, AWWA C900 Class 100:
 - 1. Fittings: AWWA C111/A21.11, cast iron.
 - 2. Joints: ASTM D3139 compression gasket ring.

2.02 VALVES

- A. Valves: Manufacturer's name and pressure rating marked on valve body.

2.03 FIRE DEPARTMENT CONNECTIONS:

- A. Free-Standing Inlet:
 - 1. Manufacturers:
 - a. Elkhart Brass Manufacturing Company, Inc: www.elkhartbrass.com/#sle.
 - b. Fire End & Croker Corporation: www.croker.com/#sle.
 - c. Potter Roemer.
 - d. Substitutions: See Section 016000 - Product Requirements.
 - 2. Construction:
 - a. Listed .
 - b. Type: Free standing type ASTM B584 poured brass alloy.
 - c. Inlets: Two way, 2-1/2 inch (65 DN) female inlets, thread size compatible with fire department hardware.
 - d. Rated Working Pressure: 175 psi (1200 kPa).

- e. Double clapper-valves, rocker-lug caps and chain, and cast-in function-identifying lettering.
- f. Brass riser sleeve.
- g. Finish: Cast brass.
- h. Label: AUTO SPKR STANDPIPE.
- i. Label: [AUTO SPKR].

2.04 PRIVATE FIRE HYDRANTS

- A. Dry-Barrel:
 - 1. Manufacturers:
 - a. American AVK Company: www.americanavk.com.
 - b. Kennedy Valve Company: www.kennedyvalve.com.
 - c. Mueller Company: www.muellercompany.com.
 - d. Substitutions: See Section 016000 - Product Requirements.
 - 2. Construction:
 - a. Listed and AWWA C502.
 - b. Rated Working Pressure: 250 psi (1725 kPa).
 - c. Compression type, opening against system pressure and closing with system pressure.
 - d. Traffic breakaway type.
 - 3. Hydrant Cap and Stuffing Box: One piece design with water-tight cavity, sealed from contact with water.
 - 4. Operating Nut: One-Piece, bronze construction with protective weather seal or shield.
 - 5. Nozzles: Tamper resistant, 1/4 turn type with O-ring seals including retaining/locking screws or other suitable nozzle lock to prevent inadvertent removal.
 - 6. Main Valve: Provide reinforced, synthetic rubber or completely encapsulated with EPDM.
 - 7. Seat: Provide O-rings to seal drain-way and barrel from water leakage into shoe.
 - 8. Drains to momentarily flush outward when opened to remove debris and complete draining upon closing of the main valve.

2.05 BEDDING AND COVER MATERIALS

- A. Bedding: As specified in Section 312316.13.
- B. Cover: As specified in Section 312316.13.

2.06 ACCESSORIES

- A. Concrete for Thrust Restraints: Concrete type specified in Section 033000.
- B. Supervisory Switches: Refer to Section 211300 for waterflow and supervisory switches.
- C. Tracer Wire:
 - 1. Manufacturers:
 - a. Copperhead Industries, LLC: www.copperheadwire.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. Provide magnetic, detectable conductor with clear plastic covering and imprinted with "Water Service" in large letters.
 - 3. Conductor to be of sufficient length to be continuous over each separate run of nonmetallic pipe.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.02 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

- A. Earthwork: Perform earthwork operations in accordance with Sections 312316, 312316.13, and 312323.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.
- C. Form and place concrete for pipe thrust restraints at each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide ____ sq feet (____ sq m) thrust restraint bearing on subsoil.
- D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION

- A. General Requirements:
 - 1. Location of Water Lines:
 - a. Do not install water line closer horizontally than 10 feet (3 m) from any sewer line unless indicated otherwise.
 - b. Water Piping Parallel With Sewer Piping:
 - 1) Install water piping minimum 10 feet (3 m) horizontally (measured edge-to-edge) from a sewer or sewer manhole where possible.
 - 2) Bottom (Invert) of Water Piping:
 - (a) Minimum 18 inches (450 mm) above top (crown) of sewer piping.
 - (b) Where this vertical separation of 18 inches (450 mm) above top (crown) of sewer piping cannot be obtained, the installation will be acceptable only when sewer piping is constructed of AWWA approved water pipe and pressure tested in place without leakage prior to backfilling.
 - 3) Sewer manhole must be of watertight construction and tested in place.
 - c. Water Piping Crossing Sewer Piping:
 - 1) Crossing Under:
 - (a) Where water lines cross under gravity sewer lines, encase sewer line fully in concrete for a distance of at least 10 feet (3 m) on each side of the crossing, unless sewer line is made of pressure pipe with rubber gasketed joints and no joint is located within 3 feet (900 mm) horizontally of the crossing.
 - 2) Crossing Over:
 - (a) Install water lines which cross over sewer force mains and inverted siphons at least 2 feet (600 mm) above these sewer lines; when joints in the sewer line are within 3 feet (900 mm) horizontally from the water line, encase joints in concrete.
 - (b) Provide a separation of at least 18 inches (450 mm) between the bottom of the water piping and the top of the sewer piping.
 - (c) When local conditions prevent a minimum, vertical separation as described above, use the following construction:
 - (1) Provide sewer piping passing over or under water piping constructed of AWWA approved ductile iron water piping, pressure tested in place without leakage prior to backfilling.
 - (2) Protect water piping passing under sewer piping by providing a vertical separation of at least 18 inches (450 mm) between the bottom of the sewer piping and the top of the water piping; adequate structural support for the sewer piping to prevent excessive deflection of the joints and the settling on and breaking of the water piping; and that the length, minimum 20 feet (6.1 m), of the water piping be centered at the point of the crossing so that joints are equidistant and located as far as possible from the sewer piping.
 - d. Do not install water lines in the same trench with electric wiring.
 - e. Do not install copper tubing in the same trench with ferrous piping materials.
 - f. Do not install water piping through or to come into contact with any part of a sewer manhole.
 - g. Where nonferrous metallic pipe crosses any ferrous piping, provide a minimum vertical separation of 1 foot (300 mm) between pipes.
 - 2. Sleeving:

- a. Sleeve water piping where piping is required to be installed within 3 feet (900 mm) of existing structures.
 - b. Provide ductile iron sleeves.
 - c. Fill annular space between pipe and sleeves with mastic.
 - d. Install water pipe and sleeve without damaging structures or causing settlement or movement of foundations or footings.
 3. Pipe Laying and Jointing:
 - a. Remove fins and burrs from pipe and fittings.
 - b. Prior to placing in position, clean pipe, fittings, valves, and accessories, and maintain in clean condition.
 - c. Provide proper facilities for lowering pipe sections into trenches.
 - d. Dropping or dumping of piping, fittings, valves, or any other water line material into trenches is not permitted.
 - e. Cut pipe in a neat workmanlike manner accurately to length established at the site and work into place without forcing or springing.
 - f. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
 - g. Wedging or blocking between bells and spigots will not be permitted.
 - h. Install bell-and-spigot pipe with the bell end pointing in the direction of laying.
 - i. Grade the pipeline in straight lines avoiding the formation of dips and low points.
 - j. Support piping at proper elevation and grade.
 - k. Secure firm, uniform support.
 - l. Wood support blocking will not be permitted.
 - m. Install pipe so that the full length of each pipe section and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.
 - n. Provide anchors and supports where necessary for fastening work into place.
 - o. Provide proper provisions for expansion and contraction of pipelines.
 - p. Keep trenches free of water until joints have been properly made.
 - q. Close open ends of piping temporarily with wood blocks or bulkheads at the end of each work day.
 - r. Do not install pipe during unacceptable trench conditions or inclement weather.
 - s. Minimum Depth of Pipe Cover: Not less than 2-1/2 feet (760 mm).
 4. Tracer Wire:
 - a. Install continuous length of tracer wire for the full length of each run of nonmetallic pipe.
 - b. Attach wire to top of pipe securely to prevent displacement during installation.
 5. Connections to Existing Water Lines:
 - a. Ensure minimal interruption of service on the existing line.
 - b. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped.
 6. Penetrations:
 - a. Provide ductile-iron for pipes passing through walls of valve pits and structures.
 - b. Fill annular space between sleeves and walls with rich cement mortar.
 - c. Fill annular space between pipe and sleeves with mastic.
 7. Flanged Pipe: Install only above grade.
- B. Special Requirements:
1. PVC Plastic Piping:
 - a. Unless otherwise specified, install pipe and fittings in accordance with paragraph "General Requirements"; with the requirements of AWWA C605 for laying of pipe, joining PVC pipe to fittings and accessories, and setting of hydrants, valves, and fittings; and with the recommendations for pipe joint assembly and appurtenance installation in AWWA M23.
 - b. Jointing:
 - 1) Push-On Joints:
 - (a) Make push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings.

- (b) For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel.
- (c) For push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint.
- (d) Use an approved lubricant recommended by the pipe manufacturer for push-on joints.
- (e) Assemble push-on joints for pipe-to-pipe joint connections in accordance with the requirements of AWWA C605 for laying the pipe and the recommendations in AWWA M23 for pipe joint assembly.
- (f) Assemble push-on joints for connection to fittings, valves, and other accessories in accordance with the requirements of AWWA C605 for joining PVC pipe to fittings and accessories and with the applicable requirements of AWWA C600 for joint assembly.
- 2) Compression-Type Joints:
 - (a) Make compression-type joints/mechanical joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint; assemble in accordance with the requirements of AWWA C605 for joining PVC pipe to fittings and accessories, with the applicable requirements of AWWA C605 for joint assembly, and with the recommendations of Appendix A to AWWA C111/A21.11.
 - (b) Cut off spigot end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel.
- 3) Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.
- c. Offset: Maximum offset in alignment between adjacent pipe joints to be as recommended by the manufacturer and approved by the Engineer/Architect, not to exceed 5 degrees.
- d. Pipe Anchorage:
 - 1) Provide concrete thrust blocks (reaction backing) for pipe anchorage, except where metal harness is indicated.
 - 2) Provide thrust blocks in accordance with the requirements of AWWA C605 for reaction or thrust blocking and plugging of dead ends, except that size and positioning of thrust blocks to be as indicated.
 - 3) Use concrete, ASTM C94/C94M, having a minimum compressive strength of 2,500 psi (15 MPa) at 28 days; or use concrete of a mix not leaner than one part cement, 2-1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.
 - 4) Provide metal harness as indicated.
- e. Fittings: Install in accordance with AWWA C605.
- C. Valves:
 - 1. Set valves on solid bearing.
- D. Free-Standing Fire Department Connections:
 - 1. Install in accordance with NFPA 13 and the Local Authority Having Jurisdiction.
 - 2. Fire Department Connection to Main: Install ball drip valves at each check valve.
- E. Fire Hydrants:
 - 1. Install in accordance with NFPA 13, the Local Authority Having Jurisdiction, and the local water utility.
 - 2. Set fire hydrant plumb and brace at grades and locations in upright position and as indicated.
 - a. Where hydrant barrel passes through concrete slab, position 1 inch (25 mm) thick piece of standard sidewalk expansion joint material around section of barrel passing through concrete.
 - 3. Provide thrust blocks on all hydrant tees.
 - a. Provide thrust block behind hydrant shoe if hydrant lateral is not restrained.
 - b. Avoid covering drain ports, bolts, or fittings when placing concrete thrust block.
 - 4. Install each fire hydrant with separate gate valve in supply pipe.
 - 5. Coating Requirements:

6. Remove and dispose of unsuitable materials and debris in accordance with local or State requirements.

3.05 SERVICE CONNECTIONS

- A. Provide 18 gage, 0.0478 inch (1.21 mm) galvanized sheet metal sleeve surrounding service main to 6 inches (150 mm) above floor and 2.5 feet (____ mm) minimum below grade. Size for 2 inches (50 mm) minimum of glass fiber insulation stuffing.

3.06 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
 1. See Section 014000 - Quality Requirements, for additional requirements.
 2. Provide all labor, equipment, and incidentals required for field testing, except that water and electric power needed for field tests will be furnished as set forth in Section 015100 - Temporary Utilities.
 3. Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently and at least 5 days after placing of concrete after concrete thrust blocks have hardened sufficiently and at least 5 days after placing of concrete.
 4. Fill pipeline 24 hours before testing and apply test pressure to stabilize system, using only potable water.
 5. Test water piping in accordance with NFPA 13, where the additional water added to the system must not exceed the limits given in NFPA 13.
 6. Pressure test piping to 150 psi (____ kPa).
 7. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
 8. Prepare reports of testing activities.

3.07 CLEANING

- A. Upon completion of the installation of water lines, and appurtenances, remove and haul away all surplus material, including debris resulting from the work.

3.08 CLOSEOUT ACTIVITIES

- A. Demonstrate proper operation of equipment to Owner's designated representative.
- B. Demonstration: Demonstrate operation of system to Owner's personnel.
 1. Use operation and maintenance data as reference during demonstration.
 2. Conduct walking tour of project.
 3. Briefly describe function, operation, and maintenance of each component.
- C. Training: Train Owner's personnel on operation and maintenance of system.
 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 2. Provide minimum of two hours of training.
 3. Location: At project site.

END OF SECTION

SECTION 211300
FIRE SUPPRESSION SPRINKLERS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Wet-pipe sprinkler system.
- B. Pre-action sprinkler system.
- C. System design, installation, and certification.

1.02 REFERENCE STANDARDS

- A. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).
- B. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
- C. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- D. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.
- E. ITS (DIR) - Directory of Listed Products; Current Edition.
- F. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Shop Drawings:
 - 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
 - 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
 - 3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Engineer/Architect.
- D. Samples: Submit two of each style of sprinkler specified.
- E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
 - 3. Sprinkler Wrenches: For each sprinkler type.
- G. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.04 QUALITY ASSURANCE

- A. Conform to UL (DIR) requirements.
- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.
- D. Equipment and Components: Provide products that bear UL label or marking.
- E. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sprinklers, Valves, and Equipment:
 - 1. Tyco Fire Protection Products, a Tyco Business: www.tyco-fire.com.
 - 2. Viking Corporation: www.vikinggroupinc.com.
 - 3. Substitutions: See Section 016000 - Product Requirements.

2.02 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Occupancy: Light Hazard (building), Ordinary Hazard Group 1).
- C. Water Supply: Determine volume and pressure from water flow test data.
- D. Interface system with building fire and smoke alarm system.
- E. Provide fire department connections where indicated.
- F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.
- G. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
 - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 - 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 - 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
 - 6. Other Types: As required.
 - 7. Manufacturers:
 - a. Powers Fasteners, Inc www.powers.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.03 SPRINKLERS

- A. Suspended Ceiling Type: Concealed pendant type with matching push on cover plate.
 - 1. Response Type: Quick.
 - 2. Coverage Type: Extended.
 - 3. Finish: Brass.
 - 4. Cover Plate Finish: Enamel, color white .
 - 5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
 - 6. Manufacturers:
 - a. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
 - b. Globe.
 - c. Substitutions: See Section 016000 - Product Requirements.
- B. Security Ceiling Type: Flush pendant institutional type.
- C. Exposed Area Type: Upright type.
 - 1. Response Type: Quick.
 - 2. Coverage Type: Extended.
 - 3. Finish: Enamel, color as selected.
 - 4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

5. Manufacturers:
 - a. Tyco.
 - b. Globe.
 - c. Substitutions: See Section 016000 - Product Requirements.
- D. Sidewall Type: Recessed horizontal sidewall type with matching push on escutcheon plate.
 1. Response Type: Quick.
 2. Coverage Type: Extended.
 3. Finish: Enamel, color as selected.
 4. Escutcheon Plate Finish: Enamel, color as selected.
 5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
 6. Manufacturers:
 - a. Tyco.
 - b. Globe.
 - c. Substitutions: See Section 016000 - Product Requirements.
- E. Flexible Drop System: Stainless steel, multiple use, open gate type.
 1. Application: Use to properly locate sprinkler heads.
 2. Include all supports and bracing.
 3. Provide braided type tube as required for the application.
 4. Manufacturers:
 - a. Victaulic Company: www.victaulic.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.04 PIPING SPECIALTIES

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
 1. Test and drain valve.
 2. Replaceable internal components without removing valve from installed position.
- B. Preaction Valve:
 1. Operated by detection system listed for releasing service and independent of building fire alarm system with provisions for local, manual, and indicated remote releases.
 2. Incorporate mechanical latching mechanism incorporating valve clappers independent of system water pressure fluctuations.
 3. Provide test detection device for each actuation circuit adjacent to each controlled valve in accordance with NFPA 13.
- C. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.

2.05 PREACTION VALVE CONTROL PANEL

- A. Provide a modular type control panel for electrically operated detection and extinguishing systems for each preaction valve.
 1. Factory mount in surface mounted, steel cabinet with hinged doors, and cylinder lock.
 2. Provide factory wired assembly containing components and equipment as required to perform specified system operating and supervisory functions.
 3. House batteries in separate and lockable, steel cabinet.
 4. Include trouble lights and trouble alarm.

2.06 AIR COMPRESSOR

- A. Compressor: Single unit, electric motor driven, motor, motor starter, safety valves, check valves, air maintenance device incorporating electric pressure switch and unloader valve.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.

- B. Install equipment in accordance with manufacturer's instructions.
- C. Install buried shut-off valves in valve box. Provide post indicator.
- D. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
- E. Locate outside alarm gong on building wall outside of riser room.
- F. Place pipe runs to minimize obstruction to other work.
- G. Place piping in concealed spaces above finished ceilings.
- H. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.
- I. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- J. Flush entire piping system of foreign matter.
- K. Hydrostatically test entire system.
- L. Require test be witnessed by Authority Having Jurisdiction.

3.02 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 220516
EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Pipe loops, offsets, and swing joints.

1.02 REFERENCE STANDARDS

- A. EJMA (STDS) - EJMA Standards; Tenth Edition.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.
- C. Design Data: Indicate selection calculations.
- D. Manufacturer's Instructions: Indicate manufacturer's installation instructions, special procedures, and external controls.
- E. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.

PART 2 PRODUCTS**2.01 EXPANSION LOOPS - HOSE AND BRAID**

- A. Manufacturers:
 - 1. The Metraflex Company; Metraloop: www.metroflex.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Provide flexible loops with two flexible sections of hose and braid, two 90 degree elbows, and 180 degree return with support bracket and air release or drain plug.
- C. Provide flexible loops capable of movement in the x, y, and z planes. Flexible loops to impart no thrust loads to the building structure.
- D. Flexible Connectors: Female copper sweat, braided type with wetted components of bronze, sized to match piping.
 - 1. Maximum Allowable Working Pressure: 150 psig (1030 kPa) at 120 degrees F (49 degrees C).
 - 2. End Connections: Same as specified for pipe jointing.
 - 3. Provide necessary accessories including, but not limited to, swivel joints.

2.02 ACCESSORIES

- A. -----
- B. Note to Specifier: The stainless steel material option above is an accessory not relating to the material of the other products below.
- C. -----
- D. Pipe Alignment Guides:
 - 1. Manufacturers:
 - a. The Metraflex Company; PGQ Glide Riser Guide: www.metroflex.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch (25 mm) thick insulation, minimum 3 inches (75 mm) travel.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

- B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.
- C. Anchor pipe to building structure where necessary. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.
- D. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

END OF SECTION

SECTION 220517
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Pipe sleeves.
- B. Manufactured sleeve-seal systems.

1.02 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified this section.
 - 1. Minimum three years experience.
- C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS**2.01 PIPE SLEEVES**

- A. Manufacturers:
 - 1. Flexicraft Industries: www.flexicraft.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Vertical Piping:
 - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
 - 2. Provide sealant for watertight joint.
 - 3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
 - 4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.
- C. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- D. Clearances:
 - 1. Provide allowance for insulated piping.
 - 2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external; pipe diameter.

3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.02 MANUFACTURED SLEEVE-SEAL SYSTEMS

- A. Manufacturers:
 1. Flexicraft Industries; PipeSeal: www.flexicraft.com/#sle.
 2. Substitutions: See Section 016000 - Product Requirements.
- B. Modular/Mechanical Seal:
 1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
 2. Provide watertight seal between pipe and wall/casing opening.
 3. Elastomer element size and material in accordance with manufacturer's recommendations.
 4. Glass reinforced plastic pressure end plates.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Inserts:
 1. Provide inserts for placement in concrete formwork.
 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 4. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
- E. Structural Considerations:
 1. Do not penetrate building structural members unless indicated.
- F. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
 1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
 2. Aboveground Piping:
 - a. Pack solid using mineral fiber complying with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
 3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
 4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- G. Manufactured Sleeve-Seal Systems:
 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
 3. Locate piping in center of sleeve or penetration.
 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.

- 5. Tighten bolting for a water-tight seal.
- 6. Install in accordance with manufacturer's recommendations.
- H. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 220523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Applications.
- B. General requirements.
- C. Ball valves.

1.02 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
- C. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022, with Errata (2023).
- D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- E. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2025.
- F. ASME B31.9 - Building Services Piping; 2025.
- G. ASTM A536 - Standard Specification for Ductile Iron Castings; 2024.
- H. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.
- I. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.04 QUALITY ASSURANCE

- A. Manufacturer:
 - 1. Obtain valves for each valve type from single manufacturer.
 - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
 - 2. Protect valve parts exposed to piped medium against rust and corrosion.
 - 3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
 - 4. Secure check valves in either the closed position or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.
 - 2. Store valves in shipping containers and maintain in place until installation.
 - a. Store valves indoors in dry environment.
 - b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

PART 2 PRODUCTS**2.01 APPLICATIONS**

- A. See drawings for specific valve locations.
- B. Required Valve End Connections for Non-Wafer Types:
 - 1. Copper Tube:
 - a. 2 NPS (50 DN) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - b. 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.
- C. Domestic, Hot and Cold Water Valves:
 - 1. 2 NPS (50 DN) and Smaller:
 - a. Bronze and Brass: Provide with solder-joint or threaded ends.
 - b. Ball: Two piece, full port, brass or bronze with brass trim.
 - 2. 2-1/2 NPS (65 DN) and Larger:
 - a. Iron, 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Provide with threaded or flanged ends.
 - b. Iron Ball: Class 150.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
 - 1. Hand Lever: Quarter-turn valves 6 NPS (150 DN) and smaller.
- D. Valves in Insulated Piping: With 2 NPS (50 DN) stem extensions and the following features:
 - 1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
- E. Valve-End Connections:
 - 1. Threaded End Valves: ASME B1.20.1.
 - 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
 - 3. Pipe Flanges and Flanged Fittings 1/2 NPS (15 DN) through 24 NPS (600 DN): ASME B16.5.
 - 4. Solder Joint Connections: ASME B16.18.
- F. General ASME Compliance:
 - 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
 - 2. Solder-joint Connections: ASME B16.18.
 - 3. Building Services Piping Valves: ASME B31.9.
- G. Valve Materials for Potable Water: NSF 61 and NSF 372.
- H. Bronze Valves:
 - 1. Fabricate from dezincification resistant material.
 - 2. Copper alloys containing more than 15 percent zinc are not permitted.
- I. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRASS BALL VALVES

- A. Two Piece, Full Port with Brass Trim:
 - 1. Comply with MSS SP-110.
 - 2. SWP Rating: 150 psig (1035 kPa).
 - 3. CWP Rating: 600 psig (4140 kPa).
 - 4. Body: Forged brass.
 - 5. Ends: Threaded or soldered.
 - 6. Seats: PTFE.
 - 7. Stem: Brass.
 - 8. Ball: Chrome-plated brass.

9. Manufacturers:
 - a. Apollo.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.04 BRONZE BALL VALVES

- A. Two Piece, Full Port with Bronze Trim:
 1. Comply with MSS SP-110.
 2. SWP Rating: 150 psig (1035 kPa).
 3. CWP Rating: 600 psig (4140 kPa).
 4. Body: Bronze.
 5. Ends: Threaded.
 6. Seats: PTFE.
 7. Stem: Bronze.
 8. Ball: Chrome plated brass.
 9. Manufacturers:
 - a. Apollo.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.05 IRON BALL VALVES

1. Comply with MSS SP-72.
2. CWP Rating: 200 psig (1380 kPa).
3. Body: ASTM A536 Grade 65-45-12, ductile iron.
4. Ends: Flanged.
5. Stem: Stainless steel.
6. Ball: Stainless steel.
7. Operator: Lever, with locking handle.
8. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C. Where valve support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

END OF SECTION

SECTION 220529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Support and attachment components for equipment, piping, and other plumbing work.

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems and post-installed concrete and masonry anchors.
- C. Shop Drawings: Include details for fabricated hangers and supports.

1.05 QUALITY ASSURANCE

- A. Comply with applicable building code.

PART 2 PRODUCTS**2.01 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:
 - 1. Comply with MSS SP-58.
 - 2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Metal Channel (Strut) Framing Systems:
1. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - b. Thomas & Betts Corporation: www.tnb.com/#sle.
 - c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
 - e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
 2. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 3. Comply with MFMA-4.
 4. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 5. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm).
 6. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch (6 mm) diameter.
 - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch (10 mm) diameter.
 - d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.
- D. Anchors and Fasteners:
1. Manufacturers - Mechanical Anchors:
 - a. Hilti, Inc: www.us.hilti.com/#sle.
 - b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.
 - c. Powers Fasteners, Inc: www.powers.com/#sle.
 - d. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
 2. Manufacturers - Powder-Actuated Fastening Systems:
 - a. Hilti, Inc: www.us.hilti.com/#sle.
 - b. ITW Ramset, a division of Illinois Tool Works, Inc: www.ramset.com/#sle.
 - c. Powers Fasteners, Inc: www.powers.com/#sle.
 - d. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
 3. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 4. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 5. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 6. Hollow Masonry: Use toggle bolts.
 7. Hollow Stud Walls: Use toggle bolts.
 8. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 9. Plastic and lead anchors are not permitted.
 10. Powder-actuated fasteners are not permitted.
 11. Hammer-driven anchors and fasteners are not permitted.
 12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.

- a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm) minimum base metal thickness.
 - d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- D. Unless specifically indicated or approved by Engineer/Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Engineer/Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 6 inch high concrete pad constructed in accordance with Section 033000.
 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Pipe markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS**2.01 IDENTIFICATION APPLICATIONS**

- A. Instrumentation: Tags.
- B. Piping: Pipe markers.
- C. Pumps: Nameplates.
- D. Small-sized Equipment: Tags.
- E. Tanks: Nameplates.
- F. Valves: Tags.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Brimar Industries, Inc.: www.pipemarker.com.
 - 2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 3. Seton Identification Products: www.seton.com.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch (6 mm).
 - 3. Background Color: Black.
 - 4. Plastic: Comply with ASTM D709.

2.03 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
 - 2. Brady Corporation: www.bradycorp.com.
 - 3. Brimar Industries, Inc.: www.pipemarker.com.
 - 4. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 5. Seton Identification Products: www.seton.com.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com.
 - 2. Brimar Industries, Inc.: www.pipemarker.com.
 - 3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 4. MIFAB, Inc.: www.mifab.com.
 - 5. Seton Identification Products: www.seton.com.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.
- F. Color code as follows:
 - 1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.

PART 3 EXECUTION**3.01 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- F. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
- G. Identify service, flow direction, and pressure.
- H. Install in clear view and align with axis of piping.
- I. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 220719
PLUMBING PIPING INSULATION**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Piping insulation.
- B. Jackets and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2024).
- C. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2024).
- D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2025.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS**2.01 REGULATORY REQUIREMENTS**

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or ASTM E84.

2.02 GLASS FIBER

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com.
 - 2. Johns Manville Corporation: www.jm.com.
 - 3. Knauf Insulation: www.knaufusa.com.

4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 2. Maximum Service Temperature: 650 degrees F (343 degrees C).
 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).
- D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
- E. Vapor Barrier Lap Adhesive: Compatible with insulation.
- F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- G. Fibrous Glass Fabric:
 1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
 2. Blanket: 1.0 lb/cu ft (16 kg/cu m) density.
 3. Weave: 5 by 5.
- H. Indoor Vapor Barrier Finish:
 1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
 2. Vinyl emulsion type acrylic, compatible with insulation, white color.
- I. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- J. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- K. Insulating Cement: ASTM C449.

2.03 JACKETS

- A. PVC Plastic.
 1. Manufacturers:
 - a. Johns Manville Corporation: www.jm.com.
 - b. Substitutions: See Section 016000 - Product Requirements.
 2. Jacket: One piece molded type fitting covers and sheet material, black color.
 - a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil (0.25 mm).
 - e. Connections: Brush on welding adhesive.
 3. Covering Adhesive Mastic: Compatible with insulation.
- B. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
 1. Lagging Adhesive: Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations. Cover with black PVC jacketing.

- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- G. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert Location: Between support shield and piping and under the finish jacket.
 - 4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.
- I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.
- J. Pipes routed in exposed ceilings: Finish with PVC jacket and fitting covers. Color: Black.
- K. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil (0.025 mm) thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

3.03 SCHEDULES

- A. Plumbing Systems:
 - 1. Domestic Hot Water Supply:
 - a. Glass Fiber Insulation:
 - 2. Domestic Hot Water Recirculation:
 - a. Glass Fiber Insulation:
 - 3. Domestic Cold Water:
 - a. Glass Fiber Insulation:
 - 4. Roof Drain Bodies:
 - a. Glass Fiber Insulation.
 - 5. Roof Drainage Above Grade:
 - a. Glass Fiber Insulation.

END OF SECTION

**SECTION 221005
PLUMBING PIPING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Storm water.
 - 4. Flanges, unions, and couplings.
 - 5. Pipe hangers and supports.
 - 6. Manufactured sleeve-seal systems.
 - 7. Valves.
 - 8. Relief valves.
 - 9. Strainers.

1.02 RELATED REQUIREMENTS

- A. Section 220553 - Identification for Plumbing Piping and Equipment.
- B. Section 220719 - Plumbing Piping Insulation.
- C. Section 330110.58 - Disinfection of Water Utility Piping Systems.

1.03 REFERENCE STANDARDS

- A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- E. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.
- F. ASME B31.1 - Power Piping; 2024.
- G. ASME B31.9 - Building Services Piping; 2025.
- H. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2025, with Errata.
- I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- J. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2025.
- K. ASTM B32 - Standard Specification for Solder Metal; 2020.
- L. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2025.
- M. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes; 2020.
- N. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- O. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- P. ASTM B813 - Standard Specification for Water Flushable Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2024.
- Q. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.
- R. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2025.

- S. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020 (Reapproved 2024).
- T. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2025.
- U. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2020.
- V. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2021.
- W. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly(Vinyl Chloride) (PVC) or Chlorinated Poly(Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020 (Reapproved 2024).
- X. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2024, with Editorial Revision (2025).
- Y. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2025.
- Z. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2025.
- AA. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing; 2024.
- BB. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
- CC. AWWA C651 - Disinfecting Water Mains; 2023.
- DD. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.
- EE. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.
- FF. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).
- GG. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
- HH. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- II. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- JJ. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- KK. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- LL. NSF 372 - Drinking Water System Components - Lead Content; 2024.
- MM. PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe; 2024.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.

- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. Brass Pipe: ASTM B43, chrome plated.
 - 1. Fittings: ASME B16.23, cast bronze, chrome plated.
 - 2. Joints: Mechanical compression.
- C. PVC Pipe: ASTM D2665 schedule 40.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.05 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn, Type K, polyethylene coated.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: AWS A5.8M/A5.8, BCuP copper/silver braze.

2.06 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Copper Pipe: ASTM B42, annealed, Type K, polyethylene coated.
 - 1. No joints below slab.

2.07 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.
- B. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.

1. Manufacturers:
 - a. Uponor, Inc; _____: www.uponorengineering.com/#sle.
 - b. Zurn Industries, LLC; _____: www.zurn.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
2. PPI TR-4 Pressure Design Basis:
3. Fittings: Brass and engineered polymer (EP) ASTM F1960.
4. Joints: ASTM F1960 cold-expansion fittings.

2.08 STORM WATER PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 1. Fittings: PVC.
 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.09 STORM WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 1. Fittings: PVC.
 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.10 STORM WATER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 1. Fittings: Cast iron.
 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.11 NATURAL GAS PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

- A. Polyethylene Pipe: ASTM D2513, SDR 11.
 1. Fittings: ASTM D2683 or ASTM D2513 socket type.
 2. Joints: Fusion welded.
 3. Install anodeless riser at all below grade to above grade connections.

2.12 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 2. Joints: Threaded or welded to ASME B31.1.

2.13 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
 1. Ferrous pipe: Class 150 malleable iron threaded unions.
 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch (25 mm):
 1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.14 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 4. Vertical Pipe Support: Steel riser clamp.
 5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
- B. Plumbing Piping - Drain, Waste, and Vent:

1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
 2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 3. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
 4. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
 5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
 2. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 3. Hangers for Hot Pipe Sizes 2 Inches (50 mm) to 4 Inches (100 mm): Carbon steel, adjustable, clevis.
 4. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
 5. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
 6. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 7. Floor Support for Hot Pipe Sizes to 4 Inches (100 mm): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
 8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 5. Other Types: As required.
 6. Manufacturers:
 - a. Powers Fasteners, Inc: www.powers.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.15 MANUFACTURED SLEEVE-SEAL SYSTEMS

- A. Manufacturers:
1. The Metraflex Company: www.metraflex.com/#sle.
 2. Substitutions: See Section 016000 - Product Requirements.
- B. Modular/Mechanical Seal:
1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
 2. Provide watertight seal between pipe and wall/casing opening.
 3. Elastomer element size and material in accordance with manufacturer's recommendations.
 4. Glass reinforced plastic pressure end plates.

2.16 BALL VALVES

- A. Manufacturers:
1. Conbraco Industries, Inc: www.apollovalves.com.
 2. Grinnell Products; _____: www.grinnell.com/#sle.
 3. Shurjoint Piping Products, Inc., a Tyco Business: www.shurjoint.com.
 4. Nibco, Inc: www.nibco.com.
 5. Milwaukee Valve Company: www.milwaukeevalve.com.
 6. Substitutions: See Section 016000 - Product Requirements.

- B. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder, threaded, or grooved ends with union.

2.17 RELIEF VALVES

- A. Temperature and Pressure:
 - 1. Manufacturers:
 - a. Watts Regulator Company: www.wattsregulator.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F (98.9 degrees C), capacity ASME BPVC-IV certified and labelled.

2.18 STRAINERS

- A. Manufacturers:
 - 1. Armstrong International, Inc: www.armstronginternational.com/#sle.
 - 2. Green Country Filter Manufacturing: www.greencountryfilter.com/#sle.
 - 3. WEAMCO: www.weamco.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Size 2 inch (50 mm) and Under:
 - 1. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
 - 2. Class 150, threaded bronze body 300 psi (2070 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
- C. Size 1-1/2 inch (40 mm) to 4 inch (100 mm):
 - 1. Class 125, flanged iron body, Y pattern with 1/16 inch (1.6 mm) stainless steel perforated screen.

2.19 RELIEF VALVES

- A. Temperature and Pressure Relief:
 - 1. Manufacturers:
 - a. Watts Regulator Company: www.wattsregulator.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 220516.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.

- I. Establish elevations of buried piping outside the building to ensure not less than 2.5 ft (____ m) of cover.
- J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; refer to Section ____.
- K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- L. Provide support for utility meters in accordance with requirements of utility companies.
- M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- N. Install bell and spigot pipe with bell end upstream.
- O. Install valves with stems upright or horizontal, not inverted. Refer to Section 220523.
- P. Install water piping to ASME B31.9.
- Q. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- R. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- S. Sleeve pipes passing through partitions, walls and floors.
- T. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
- U. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as indicated.
 - 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 7. Provide copper plated hangers and supports for copper piping.
 - 8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 - 9. Support cast iron drainage piping at every joint.
- V. Manufactured Sleeve-Seal Systems:
 - 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 - 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
 - 3. Locate piping in center of sleeve or penetration.
 - 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
 - 5. Tighten bolting for a water-tight seal.
 - 6. Install in accordance with manufacturer's recommendations.

- W. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/4 inch per foot, 1/8 inch per foot (1:100), or 1/16 inch per foot slope as dictated by pipe size. Use minimum slope possible, especially for large pipes.
- B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SERVICE CONNECTIONS

- A. Provide new sanitary and storm sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service in accordance with local utility.
 - 1. Provide 18 gage, 0.0478 inch (1.21 mm) galvanized sheet metal sleeve around service main to 6 inch (150 mm) above floor and 6 feet (1800 mm) minimum below grade. Size for minimum of 2 inches (50 mm) of loose batt insulation stuffing.
- C. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 11 inch wg (2.7 kPa).

3.08 SCHEDULES

- A. Pipe Hanger Spacing: Install in accordance with the International Plumbing Code.

END OF SECTION

SECTION 221119
DOMESTIC WATER PIPING SPECIALTIES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Backflow preventers.
- B. Vacuum breakers.
- C. Water pressure reducing valves.
- D. Mixing valves.
- E. Balancing valves.
- F. Strainers.
- G. Outlet boxes.
- H. Hose bibbs.
- I. Hydrants.
- J. Drain valves.
- K. Water-hammer arrestors.

1.02 REFERENCE STANDARDS

- A. ASSE 1001 - Performance Requirements for Atmospheric Type Vacuum Breakers; 2021.
- B. ASSE 1010 - Performance Requirements for Water Hammer Arresters; 2021.
- C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.
- D. ASSE 1017 - Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems; 2023.
- E. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2023.
- F. ASSE 1052 - Performance Requirements for Hose Connection Backflow Preventers; 2023.
- G. ASSE 1053 - Performance Requirements for Dual Check Backflow Preventer Wall Hydrants - Freeze Resistant Type; 2019 (Reaffirmed 2023).
- H. ASSE 1057 - Performance Requirements for Freeze Resistant Sanitary Yard Hydrants with Backflow Protection; 2023.
- I. ASSE 1060 - Performance Requirements for Outdoor Enclosures for Fluid Conveying Components; 2017 (Reaffirmed 2021).
- J. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- K. NSF 372 - Drinking Water System Components - Lead Content; 2024.
- L. PDI-WH 201 - Water Hammer Arresters; 2017.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- C. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
- D. Store products under cover and protected from weather and dirt. Elevate above grade.
- E. Protect end connections, flanges, threads, and grooves from dirt and damage.
- F. Protect product interiors against rust and corrosion.
- G. Do not use operating handles or stems as lifting or rigging points.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS**2.01 GENERAL REQUIREMENTS**

- A. Specialties in Potable Water Supply Systems: Provide products complying with NSF 61 and NSF 372.
- B. Source Limitations: Furnish domestic water piping specialties of same kind by same manufacturer.
- C. Provide brass-bodied domestic water piping specialties in DZR brass.

2.02 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Principle Backflow Preventers:
- B. Double-Check Valve Backflow Preventers:

2.03 VACUUM BREAKERS

- A. Atmospheric Vacuum Breakers:
 - 1. Valve: ASSE 1001, brass, bronze, or copper silicon alloy.
 - 2. Maximum Working Pressure: 125 psi (8.6 bar).
 - 3. Working Temperature Range: 33 to 180 degrees F (0.5 to 82 degrees C).
- B. Hose-Connection Vacuum Breakers:
 - 1. Valve: ASSE 1011, brass, nonremovable, drainable, with hose-thread end connections.
 - 2. Maximum Working Pressure: 125 psi (8.6 bar).
 - 3. Working Temperature Range: 33 to 180 degrees F (0.5 to 82 degrees C).

2.04 MIXING VALVES

- A. Thermostatic Master Mixing Valves:
 - 1. Valve: ASSE 1017, brass or bronze body; thermostatic element; corrosion- and lime-resistant internal components; integral locking temperature adjustment.

2.05 BALANCING VALVES

- A. Manual Balancing Valves:
 - 1. Valve: Brass, ball or globe valve design, with metering ports, position indicator, and memory stop.
 - 2. Maximum Working Pressure: 150 psi (10.3 bar).
 - 3. Working Temperature Range: 33 to 200 degrees F (0.5 to 93 degrees C).

2.06 STRAINERS**2.07 OUTLET BOXES**

- A. Washing Machine Outlet Boxes:
 - 1. Description: Plastic preformed rough-in box with brass quarter-turn ball valves or single lever valve, socket for 2-inch (50 mm) waste, and slip-in finishing cover.
- B. Ice Maker Outlet Boxes:
 - 1. Description: Plastic preformed square or round rough-in box with quarter-turn ball valve and slip-in finishing cover.

2.08 HYDRANTS

- A. Wall Hydrants:
 - 1. Assembly: ASSE 1011, ASSE 1019, ASSE 1052, or ASSE 1053.
 - 2. Hydrant: Freeze-resistant, self-draining, wall-mounted.
 - a. Valve: Bronze or brass body.
 - b. Hose Connection: Threaded, with integral vacuum breaker or backflow preventer.
 - 3. Maximum Working Pressure: 125 psi (8.6 bar).
 - 4. Working Temperature Range: 33 to 120 degrees F (0.5 to 50 degrees C).
- B. Yard Hydrants:
 - 1. Assembly: ASSE 1052 or ASSE 1057.

2. Hydrant: Freeze-resistant, self-draining, with post-mounted epoxy-coated cast-iron head and lift handle.
 - a. Valve: Buried bronze or brass valve, connected to hydrant head via operating rod.
 - b. Post: Galvanized-steel pipe. Post acts as casing for water carrier pipe and operating rod.
 - c. Hose Connection: Threaded, with integral vacuum breaker or backflow preventer.
 - d. Operation: Cast-iron lift handle, lockable.
3. Maximum Working Pressure: 125 psi (8.6 bar).
4. Working Temperature Range: 33 to 120 degrees F (0.5 to 50 degrees C).

2.09 DRAIN VALVES

- A. Ball-Valve Hose-End Drain Valves:
 1. Valve: Two-piece, full-port ball valve in brass or bronze with capped hose-end connection.
 2. Pressure Rating: 250 psi (17.2 bar).
 3. Working Temperature Range: 33 to 140 degrees F (0.5 to 60 degrees C).

2.10 WATER-HAMMER ARRESTORS

- A. Manufacturers:
- B. Piston Type:
 1. Description: ASSE 1010 or PDI-WH 201, copper body with plastic piston and EPDM O-rings.
 2. Air Preload Pressure: 60 psi (410 kPa).
 3. Maximum Working Pressure: 150 psi (10.3 bar).
 4. Working Temperature Range: 33 to 180 degrees F (0.5 to 82 degrees C).
- C. Bellows Type:
 1. Description: ASSE 1010 or PDI-WH 201, stainless steel body with stainless steel bellows.
 2. Maximum Working Pressure: 150 psi (10.3 bar).
 3. Working Temperature Range: 33 to 180 degrees F (0.5 to 82 degrees C).

2.11 ACCESSORIES

- A. Outdoor Backflow Preventer Enclosures:
 1. Insulated Enclosure with Heat Source for Freeze Protection:
 - a. Assembly: ASSE 1060, Class I.
 - b. Description: Insulated and heated enclosure to protect aboveground piping, specialties, and equipment from vandalism, damage, weather, and freezing.
 - c. Construction:
 - 1) Enclosure Envelope: Insulated, reinforced fiberglass or aluminum.
 - 2) Locking access doors.
 - 3) Anchors for attaching enclosure to concrete base.
 - 4) Drain opening.
 - d. Heating System: Provide electric heat tracing or electric space heater including temperature controls.
 - 1) Electric Heat Tracing: Provide capacity to maintain water temperature at or above 40 degrees F (4 degrees C) when outdoor design temperature is minus 30 degrees F (minus 34 degrees C).
 - 2) Electric Space Heater: Provide capacity to maintain internal space temperature at or above 40 degrees F (4 degrees C) when outdoor design temperature is minus 30 degrees F (minus 34 degrees C).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Prior to installation of domestic water piping specialties, flush domestic water piping of foreign material.
- B. Install products in accordance with manufacturer's instructions.
- C. Install products level and plumb.
- D. Install products with clearance for access and maintenance.

- E. Support products NPS 2-1/2 (DN 65) and larger independently of surrounding pipe.
- F. Support products with flanged or grooved ends independently of surrounding pipe.
- G. For products containing isolation or shutoff valves, locate valves in horizontal piping with stems at or above center of piping, maintaining unimpeded stem movement.
- H. Backflow Preventers:
 - 1. Install backflow preventers in accordance with requirements of local authorities having jurisdiction, including requirements of local water utility.
 - 2. Pipe relief from reduced-pressure-principle backflow preventers to nearest drain.
- I. Balancing Valves: Install in accessible locations. Install shutoff valves on inlet and outlet.
- J. Water Hammer Arrestors: Install in accordance with PDI-WH 201.
- K. Outdoor Backflow Enclosures:
 - 1. Anchor enclosures to flat concrete base.
 - 2. For enclosures with internal heat source, see Section 260583 for electrical connections.

3.02 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Inspect each product for damage and defects.
- C. Repair or replace damaged products.
- D. Replace defective products.
- E. For products containing isolation or shutoff valves, exercise isolation and shutoff valves from fully closed to fully open. Confirm smooth operation.
- F. Backflow Preventers:
 - 1. Test in accordance with manufacturer's instructions.
 - 2. Test in accordance with requirements of authorities having jurisdiction.
 - 3. Test in accordance with ASSE listing of backflow preventer.
 - 4. Replace backflow preventers that fail testing.
- G. Vacuum Breakers:
 - 1. Test in accordance with manufacturer's instructions.
 - 2. Test in accordance with requirements of authorities having jurisdiction.
 - 3. Test in accordance with ASSE listing of vacuum breaker.
 - 4. Replace vacuum breakers that fail testing.
- H. Mixing Valves: Confirm outlet temperature remains steady without fluctuation.
- I. Coordination of Other Tests and Inspections: Provide access to accommodate tests and inspections by independent testing agencies employed by Owner.

3.03 ADJUSTING

- A. Adjust mixing valves to design temperature set point.
- B. Adjust balancing valves to design flow.

3.04 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Clean products to remove dirt, paint, and other foreign materials.
- C. Clean surfaces of products exposed to view in finished spaces to remove dirt, fingerprints, paint, and other foreign materials. Restore finishes to match original factory finish.
- D. Clean surfaces of products exposed to view on building exterior to remove dirt, fingerprints, paint, and other foreign materials. Restore finishes to match original factory finish.
- E. Clean strainers, including those internal to other products, prior to mm-dd-yyyy.

3.05 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.

END OF SECTION

SECTION 221323
SANITARY WASTE INTERCEPTORS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Grease interceptors.
- B. Solids interceptors.

1.02 RELATED REQUIREMENTS

- A. Section 221005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

- A. ASME A112.14.3 - Hydromechanical Grease Interceptors; 2022.
- B. ASTM C1613 - Standard Specification for Precast Concrete Grease Interceptor Tanks; 2024a.
- C. IAPMO/ANSI/CAN Z1001 - Standard for Prefabricated Gravity Grease Interceptors; 2021.
- D. PDI G101 - Testing and Rating Procedure for Grease Interceptors; 2017.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

PART 2 PRODUCTS**2.01 GENERAL REQUIREMENTS****2.02 GREASE INTERCEPTORS**

- A. Gravity Grease Interceptors, Concrete:
 - 1. Assembly: IAPMO/ANSI/CAN Z1001.
 - 2. Body: Precast concrete, ASTM C1613.
 - 3. Manhole Access: Minimum of one manhole per chamber.
 - 4. Manhole Covers: Cast iron, gasketed, gastight, and watertight; rated for minimum loading of 16,000 lb (7260 kg).
 - 5. Construction Details:
 - a. Deep seal trap at inlet.
 - b. Concrete baffle between each chamber.
 - c. Fluid transfer piping between each chamber.
 - d. Venting piping between each chamber.
 - e. Outlet pipe with sampling tee.
- B. Hydromechanical Grease Interceptors, 50 gpm (3.0 L/sec) and Larger:
 - 1. Assembly: PDI G101 and ASME A112.14.3.
 - 2. Body: Thermoplastic polymer.
 - 3. Construction Details:
 - a. Flow control fitting.
 - b. Deep seal trap.
 - c. Internal baffles.
 - d. Internal air relief bypass.
- C. Hydromechanical Grease Interceptors, 50 gpm (3.0 L/sec) and Smaller:
 - 1. Assembly: PDI G101 and ASME A112.14.3.
 - 2. Body: Thermoplastic polymer.
 - 3. Lid: Gasketed, secured, nonskid, in same material as body of interceptor.
 - 4. Construction Details:
 - a. Flow control fitting.
 - b. Deep seal trap.
 - c. Internal baffles.
 - d. Internal air relief bypass.

2.03 SOLIDS INTERCEPTORS

- A. Fur and Lint Interceptors:
 - 1. Manufacturers:
 - 2. Body: Thermoplastic polymer.
 - 3. Lid: Gasketed, secured, nonskid, in same material as body of interceptor.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions, adopted code, and requirements of local authorities having jurisdiction.
- B. Install interceptors level and plumb.
- C. Refer to drawings and see Section 221005 for requirements for waste and vent piping to and from interceptors.
- D. Support waste and vent piping independently from interceptors.
- E. Vent interceptors in accordance with adopted code and with requirements of local authorities having jurisdiction.
- F. Install interceptors with clearance for access and maintenance, including removal of sediment buckets, screens, and strainers.

3.02 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Test interceptors for leaks in accordance with manufacturer's instructions.

3.03 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Clean debris from within interceptors.
- C. Clean lids and manhole covers to remove dirt, debris, and other foreign material.

3.04 CLOSEOUT ACTIVITIES

3.05 PROTECTION

- A. Protect installed interceptors from accumulating dirt and debris through remainder of construction.
- B. Protect installed products from damage due to subsequent construction operations.

END OF SECTION

SECTION 221423
STORM DRAINAGE PIPING SPECIALTIES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Roof and exterior surface drains.
- B. Downspout adaptors, boots, and nozzles.
- C. Cleanouts.
- D. Backwater valves.

1.02 RELATED REQUIREMENTS**1.03 REFERENCE STANDARDS**

- A. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2022.
- B. ASME A112.14.1 - Backwater Valves; 2003 (Reaffirmed 2022).
- C. ASME A112.36.2 - Cleanouts; 2022.
- D. NSF 14 - Plastics Piping System Components and Related Materials; 2023.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- C. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
- D. Store products under cover and protected from weather and dirt. Elevate above grade.
- E. Store plastic products protected from direct sunlight.

PART 2 PRODUCTS**2.01 GENERAL REQUIREMENTS**

- A. Plastic Storm Drainage Piping Specialties: Provide plastic products complying with NSF 14.
- B. Source Limitations: Furnish drains and storm drainage piping specialties of same kind by same manufacturer.

2.02 ROOF AND EXTERIOR SURFACE DRAINS

- A. Cast Iron Roof Drains and Overflow Roof Drains:
 - 1. Assembly: ASME A112.6.4.
 - 2. Body: Lacquered cast iron with membrane clamping ring with gravel stop.
 - 3. Strainer: Removable thermoplastic polymer dome with vandal-proof screws.
 - 4. Overflow Drains: Provide 2-inch (50 mm) high external overflow waterdam or internal standpipe extension.
 - 5. Products:
 - a. Zurn Industries, LLC; : www.zurn.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.03 DOWNSPOUT ADAPTERS, BOOTS, AND NOZZLES

- A. Downspout Nozzles, Metal:
 - 1. Description: Cast bronze or nickel bronze wall-mounted fitting for terminating interior rainwater leader on building exterior, with anchor flange and decorative cow's tongue outlet.

2.04 CLEANOUTS

- A. Manufacturers:
- B. Floor Cleanouts:

1. Assembly: ASME A112.36.2.
2. Body: Lacquered cast iron.
3. Closure Plug: PVC or ABS, threaded, gastight and watertight.
4. Top: Adjustable, with vandal-proof screws.

2.05 BACKWATER VALVES

- A. Cast Iron Backwater Valves:
 1. Assembly: ASME A112.14.1.
 2. Horizontal: Lacquered cast iron body, flapper valve, and bolted, gasketed access cover.
 3. Vertical: Lacquered cast iron body, ball-type float, and replaceable seals.
- B. Plastic Backwater Valves:
 1. Assembly: ASME A112.14.1.
 2. Description: PVC or ABS body and flapper valve, with gasketed, threaded access cap.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Maintain continuity of waterproofing membranes. Secure waterproofing membranes to drain clamping collars.
- C. Install roof drains at low points of roof areas.
- D. Extend cleanouts to finished floor or wall surface. Ensure clearance at cleanout for rodding or jetting of drainage system.
- E. Install floor cleanouts to allow for floor finishes.
- F. Locate, provide, and install cleanouts in piping in accordance with adopted code.

3.02 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Clean debris from drains.
- C. Clean grates and strainers prior to mm-dd-yyyy.

3.03 PROTECTION

- A. Protect installed drains from accumulating dirt and debris through remainder of construction.
- B. Protect installed products from damage due to subsequent construction operations.

END OF SECTION

SECTION 223000
PLUMBING EQUIPMENT**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Water Heaters:
 - 1. Commercial gas fired.
 - 2. Commercial electric.
- B. Diaphragm-type compression tanks.
- C. Acid neutralizers.
- D. In-line circulator pumps.
- E. Submersible sump pumps.

1.02 REFERENCE STANDARDS

- A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2025, with Errata .
- B. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittals procedures.
- B. Product Data:
 - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
 - 2. Indicate pump type, capacity, power requirements.
 - 3. Provide electrical characteristics and connection requirements.
- C. Shop Drawings:
 - 1. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
- D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Certifications:
 - 1. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.
- C. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for water storage tanks.

PART 2 PRODUCTS**2.01 WATER HEATERS**

- A. Manufacturers:

1. A.O. Smith Water Products Co; _____: www.hotwater.com/#sle.
 2. Rheem Manufacturing Company; _____: www.rheem.com/#sle.
 3. Substitutions: See Section 016000 - Product Requirements.
- B. Commercial Gas Fired:
1. Type: Automatic, natural gas-fired, vertical storage.
 2. Tank: Glass lined welded steel ASME labeled; multiple flue passages, 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.
- C. Commercial Electric:
1. Type: Factory-assembled and wired, electric, vertical storage.
 2. Tank: Glass lined welded steel; 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
 3. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F (16 to 82 degrees C), flanged or screw-in nichrome elements, high temperature limit thermostat.
 4. Accessories:
 - a. Water Connections: Brass.
 - b. Anode: ____.

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

- A. Manufacturers:
1. Amtrol Inc: www.amtrol.com/#sle.
 2. Bell & Gossett, a xylem brand: www.bellgossett.com/#sle.
 3. Taco, Inc: www.taco-hvac.com/#sle.
 4. Wessels.
 5. Wilkins: www.zurn.com
 6. Substitutions: See Section 016000 - Product Requirements.
- B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig (860 kPa), with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.
- C. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig (80 kPa).

2.03 ACID NEUTRALIZERS

- A. Manufacturers:
1. Zurn.
 2. Spears.
 3. Substitutions: See Section 016000 - Product Requirements.
- B. Performance:
1. Media consists of limestone mineral media.
- C. Mineral Tank: ABS or CPVC.

2.04 IN-LINE CIRCULATOR PUMPS

- A. Manufacturers:
1. ITT Bell & Gossett: www.bellgossett.com.
 2. Substitutions: See Section 016000 - Product Requirements.

2.05 SUBMERSIBLE SUMP PUMPS

- A. Manufacturers:
1. Liberty Pumps.
- B. Type: Completely submersible, vertical, centrifugal.
- C. Casing: Cast iron pump body and oil filled motor chamber.
- D. Impeller: Cast iron; open non-clog, stainless steel shaft.

- E. Bearings: Ball bearings.
- F. Accessories: Oil resistant 6 foot (2 m) cord and plug with three-prong connector for connection to electric wiring system including grounding connector.

2.06 ELECTRICAL WORK

- A. Electrical characteristics to be as specified or indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related electrical work to achieve operating system.
- C. Domestic Water Storage Tanks:
 - 1. Provide electrical interlocking from cooling condensate pump safety switch to associated HVAC unit(s) furnished under other Sections.

END OF SECTION

SECTION 224000
PLUMBING FIXTURES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Service sinks.
- F. Mop sinks.
- G. Electric water coolers.
- H. Drinking fountains.
- I. Showers.
- J. Eye and face wash fountains.

1.02 RELATED REQUIREMENTS

- A. Section 114000 - Foodservice Equipment: Food service sinks.
- B. Section 221005 - Plumbing Piping.
- C. Section 221006 - Plumbing Piping Specialties.
- D. Section 223000 - Plumbing Equipment.

1.03 REFERENCE STANDARDS

- A. IAPMO Z124 - Plastic Plumbing Fixtures; 2022, with Editorial Revision.
- B. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2014.
- C. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008 (Reaffirmed 2013).
- D. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- E. ASME A112.18.1 - Plumbing Supply Fittings; 2024.
- F. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2024.
- G. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2022.
- H. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2024.
- I. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers; 2020.
- J. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- L. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- M. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- N. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- O. NSF 372 - Drinking Water System Components - Lead Content; 2024.
- P. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 REGULATORY REQUIREMENTS

- A. Comply with applicable codes for installation of plumbing systems.
- B. Comply with UL (DIR) requirements.
- C. Perform work in accordance with local health department regulations.

2.03 FLUSH VALVE WATER CLOSETS

- A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
 - 1. Bowl: ASME A112.19.2; 18 inches (450 mm) high with elongated rim.
 - 2. Flush Valve: Exposed (top spud).
 - 3. Flush Operation: Manual, oscillating handle.
 - 4. Supply Size: 1-1/2 inches (38 mm).
 - 5. Color: White.
 - 6. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com.
 - b. Kohler Company: www.kohler.com/#sle.
 - c. Zurn Industries, Inc: www.zurn.com/#sle.
 - d. Toto.
 - e. Substitutions: See Section 016000 - Product Requirements.
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
 - 1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
 - 2. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com/#sle.
 - b. Sloan Valve Company: www.sloanvalve.com/#sle.
 - c. Zurn Industries, Inc: www.zurn.com/#sle.
 - d. Toto.
 - e. Hydrotek.
 - f. Substitutions: See Section 016000 - Product Requirements.
- C. Seats:

1. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com/#sle.
 - b. Bemis Manufacturing Company: www.bemismfg.com/#sle.
 - c. Church Seat Company: www.churchseats.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

2.04 WALL HUNG URINALS

- A. Wall Hung Urinal Manufacturers:
 1. American Standard, Inc: www.americanstandard-us.com.
 2. Kohler Company; _____: www.kohler.com/#sle.
 3. Zurn Industries, Inc; EcoVantage Z5798 High-Efficiency Urinal System: www.zurn.com/#sle.
 4. Toto.
 5. Substitutions: See Section 016000 - Product Requirements.
- B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
 1. Flush Volume: 0.125 gallons (0.47 liters), maximum.
 2. Flush Style: Washout.
 3. Flush Valve: Exposed (top spud).
 4. Flush Operation: Manual, oscillating handle.
 5. Trap: Integral.
 6. Removable stainless steel strainer.
 7. Supply Size: 3/4 inch (19 mm).
 8. Outlet Size: 2 inches (50 mm).
- C. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
 1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
 2. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com.
 - b. Sloan Valve Company: www.sloanvalve.com/#sle.
 - c. Zurn Industries, Inc: www.zurn.com/#sle.
 - d. Toto.
 - e. Substitutions: See Section 016000 - Product Requirements.
- D. Carriers:
 1. Manufacturers:
 - a. JOSAM Company: www.josam.com.
 - b. Zurn Industries, Inc: www.zurn.com.
 - c. Substitutions: See Section 016000 - Product Requirements.
 2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.05 LAVATORIES

- A. Lavatory Manufacturers:
 1. American Standard, Inc: www.americanstandard-us.com.
 2. Kohler Company: www.kohler.com/#sle.
 3. Zurn Industries, Inc: www.zurn.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, _____ minimum, with 4 inch (100 mm) high back, rectangular basin with splash lip, front overflow, and soap depression.
- C. Supply Faucet Manufacturers:
 1. Chicago FAUCETS.
 2. Substitutions: See Section 016000 - Product Requirements.

- D. Supply Faucet: ASME A112.18.1; chrome plated combination supply fitting with open grid strainer, water economy aerator with maximum flow of 0.5 gallon per minute (low-flow) (1.9 liters per minute (low-flow)), single lever handle.
- E. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.
- F. Accessories:
 - 1. Chrome plated 17 gage, 0.0538 inch (1.37 mm) brass P-trap with clean-out plug and arm with escutcheon.
 - 2. Offset waste with perforated open strainer.
 - 3. Flexible supplies.
 - 4. Carrier:
 - a. Manufacturers:
 - 1) JOSAM Company; _____: www.josam.com/#sle.
 - 2) Zurn Industries, Inc; _____: www.zurn.com/#sle.
 - 3) Substitutions: See Section 016000 - Product Requirements.
 - b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

2.06 SINKS

- A. Sink Manufacturers:
 - 1. Elkay.
 - 2. Advance Tabco
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Single Compartment Bowl: ASME A112.19.3; _____ by _____ by _____ inch (_____ by _____ by _____ mm) outside dimensions 20 gage, 0.0359 inch (0.91 mm) thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
 - 1. Drain: 1-1/2 inch (38 mm) chromed brass drain.
 - 2. Drain: 3-1/2 inch (90 mm) crumb cup and tailpiece.
- C. Double Compartment Bowl: ASME A112.19.3; _____ by _____ by _____ inch (_____ by _____ by _____ mm) outside dimensions 20 gage, 0.0359 inch (0.91 mm) thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
 - 1. Drain: 1-1/2 inch (38 mm) chromed brass drain.
 - 2. Drain: 3-1/2 inch (90 mm) crumb cup and tailpiece.

2.07 SHOWER RECEPTORS

- A. Solid Surfacing Shower Receptors: Solid terrazzo, self-supporting, for installation over conventional subfloor; complying with ANSI Z124.1.2.
 - 1. Material: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, renewable material filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - 2. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 450 or less, Class A, when tested in accordance with ASTM E84.
 - 3. Finish on Exposed Surfaces: Provide satin or matte, gloss rating of 3 to 20.
 - 4. Color and Pattern: white.
 - 5. With integral linear drain.
 - 6. Manufacturers:
 - a. Inpro.
 - b. Comfort Systems.
 - c. Substitutions: See Section 016000 - Product Requirements.
- B. Drain Trim: Removable chrome plated strainer and tail piece.

2.08 SHOWERS

- A. Shower Manufacturers:
 - 1. Inpro.

2. Substitutions: See Section 016000 - Product Requirements.
- B. Trim: ASME A112.18.1; concealed shower supply with pressure balanced mixing valves, integral service stops, bent shower arm with adjustable spray ball joint shower head with maximum flow, and escutcheon.
- C. -- To specify the shower and valve separately, use the paragraphs below. --
- D. Shower Head:
 1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 2.5 gpm (0.16 L/s) flow control.
- E. Hand-Held Shower Head:
 1. ASME A112.18.1, adjustable spray hand-held shower head with swivel fitting, with ASSE 1014 backflow preventer.
 2. Include 60 inch (1525 mm) minimum flexible polished stainless steel hose and in-line vacuum breaker
 3. Provide wall bracket to mount hand spray, allowing use of the unit as either a hand-held spray or a fixed shower head.

2.09 BI-LEVEL, ELECTRIC WATER COOLERS

- A. Bi-level, Electric Water Cooler Manufacturers:
 1. Elkay Manufacturing Company; _____: www.elkay.com/#sle.
 2. Hasley Taylor.
 3. Substitutions: See Section 016000 - Product Requirements.
- B. Bottle Filler: Materials to match fountain.

2.10 MOP SINKS

- A. Mop Sink Manufacturers:
 1. Acorn Engineering Company; _____: www.americanstandard-us.com/#sle.
 2. Substitutions: See Section 016000 - Product Requirements.
- B. Dimensions: As indicated on drawings.
- C. Accessories:
 1. 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced plastic hose.
 2. Hose clamp hanger.
 3. Mop hanger.

2.11 EMERGENCY EYE AND FACE WASH

- A. Emergency Wash Manufacturers:
 1. Guardian.
 2. Substitutions: See Section 016000 - Product Requirements.
- B. Emergency Wash: ANSI Z358.1; counter top, self-cleaning, non-clogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receptor, twin eye wash heads and face spray ring, _____ control valve and fittings.
- C. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

- A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 224600
SECURITY PLUMBING FIXTURES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Water closets.
- B. Manual flushometer.
- C. Lavatories.
- D. Combination units.
- E. Fixture supports (carriers).
- F. Showers.

1.02 RELATED REQUIREMENTS

- A. Section 221005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASME A112.18.1 - Plumbing Supply Fittings; 2024.
- C. ASME A112.18.2 - Plumbing Waste Fittings; 2020.
- D. ASME A112.18.6 - Flexible Water Connectors; 2017 (Reaffirmed 2021).
- E. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2022.
- F. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- G. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.
- H. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- I. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS**2.01 WATER CLOSETS**

- A. Manufacturers:
 - 1. Willoughby Industries, Inc; _____: www.willoughby-ind.com/#sle.
 - 2. ACORN.
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Configuration: Wall hung single piece with siphon jet flush, trap and back-outlet.
- C. Material: ASME A112.19.3, seamless welded 304 stainless steel with elongated opening.
- D. Exposed Surface Finish: Baked-on white color powder coating with anti-microbial additive.

2.02 MANUAL FLUSHOMETER

- A. Wall Mount Configuration: Concealed (back spud coupling) with wall flange.
- B. Flush Capacity: Match selected water closet and urinal rate.

2.03 LAVATORIES

- A. Chase (rear) mounted, 18 inch (45.7 cm) wide oval basin, tamper-resistant removable bottom (concealed) faucet supply and trap to wall waste outlet connections.
- B. Faucet Type: Dual temperature, single fixture valve with thermostatic control.
- C. Water Faucet Inlet Size: 3/8 inch (9.5 mm), concealed.
- D. Material: Seamless welded 304 stainless steel polished to a smooth finish.

- E. Flow Capacity: Metered, 0.25 gallons per cycle (0.95 liters per cycle) at 60 psi (4.1 bar).

2.04 COMBINATION UNITS

- A. Manufacturers:
1. Acorn Engineering Company, Inc; _____: www.acorneng.com/#sle.
 2. Substitutions: See Section 016000 - Product Requirements.
- B. Ligature-resistant, 15 inch (381 mm)-width, toilet-lavatory combination unit.
- C. Toilet:
1. Chase-mounted, 90-degree bowl with siphon jet flush, flushometer, trap and back-outlet.
 2. Flush Capacity: Ultra-low flow (ULF) at 1.6 gallons (6.05 liters) at 35 psi (2.4 bar).
 3. Seat Type and Rim Height: Handicap-ADA compliant, 18 inch (45.7 cm), contoured.
- D. Lavatory:
1. Pre-installed vandal-resistant faucet.
 2. Flow Capacity: 0.125 gallons (0.47 liters) at 25 psi (1.7 bar).
 3. Inlet Size and Valve Location: 3/4 inch (19 mm), concealed (back spud).
- E. Material:
1. Exposed Surface Finish: Polished to satin finish.
 2. Material: ASME A112.19.3, seamless welded 304 stainless steel.

2.05 FIXTURE SUPPORTS (CARRIERS)

- A. Lavatories:
1. Steel-based institutional-grade fixture support (carrier) with height-adjustable plate.
 2. Rated to transfer rated fixture load to floor-end in compliance with ASME A112.6.1M.

2.06 SHOWERS

- A. General Requirements:
1. Potable Water Service: Provide faucets, pipe, tubing, and fittings in compliance with NSF 61 and NSF 372 for maximum lead content. Affix label tags to pipe, tubing, and fittings.
 2. Water Efficiency Certification: Product to have affixed EPA WaterSense compliance label.
- B. Shower Panel Type:
1. Shower Head: Stainless steel, 30 degree, ligature-resistant, vandal-proof institutional-grade type rated for low-flow at 1.5 gpm (5.6 lpm).
 2. Operator Trim: Dual-temperature, pneumatically timed push-button control.
 3. Valve: ASSE 1070, rough brass, thermostatic mixing, pneumatically metered adjustable from 5 to 60 seconds with strainer, inlet-side check valve, and flexible stainless steel connectors.
 4. Material: Seamless welded 304 stainless steel polished to a smooth finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

3.02 PREPARATION

- A. Set fixture-height in accordance with manufacturer recommendations otherwise apply the values listed within section schedule per particular fixture.
- B. Set fixture rough-in piping connection sizes in accordance manufacturer recommendations otherwise apply minimum values per service listed within section schedule per particular fixture.

3.03 REGULATORY REQUIREMENTS

- A. Perform work in accordance with local health department regulations.
- B. Provide installation compliance certificate from Authority Having Jurisdiction.

3.04 INSTALLATION

- A. Provide fixture rough-in's with interconnecting fittings per Section 221005 requirements.
- B. Provide supply fittings per fixture type as recommended in ASME A112.18.1.

- C. Provide waste fittings per fixture type as recommended in ASME A112.18.2.
- D. Provide flexible supply connectors per lavatory as recommended in ASME A112.18.6.
- E. Install fixtures and fittings in accordance with the manufacturer's instructions.
- F. Caulk fixtures and accessories as indicated.
- G. Install flushometer and faucets at prescribed heights in compliance with ADA Standards.
- H. Install, level, and secure fixtures in place with wall supports, and bolts.
- I. Install fixture valves, traps, and related service components at reasonable locations free of limited space or obstructions to ensure easy removal for servicing and cleaning.
- J. Install components, level, and plumb each fixture utility service component.

3.05 ADJUSTING

3.06 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.

3.07 CLEANING

3.08 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Repair or replace products damaged prior to issuing Certificate of Substantial Completion.

END OF SECTION

SECTION 230548
VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Vibration isolation requirements.
- B. Vibration isolators.
- C. Vibration-isolated and/or seismically engineered roof curbs.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
 - 1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification method for spring element load capacities.
- C. Shop Drawings - Vibration Isolation Systems:
 - 1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS**2.01 VIBRATION ISOLATION REQUIREMENTS**

- A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.
- B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:
- C. General Requirements:
 - 1. Select vibration isolators to provide required static deflection.
 - 2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
 - 3. Select vibration isolators for outdoor equipment to comply with wind design requirements.
 - 4. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2 inch (50 mm) operating clearance beneath base unless otherwise indicated.
- D. Equipment Isolation: As indicated on drawings.
- E. Piping Isolation:
 - 1. Provide vibration isolators for piping supports:
 - a. Located in equipment rooms.
 - 2. Minimum Static Deflection:
 - a. First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch (50 mm) deflection required.
 - 3. Suspended Piping, Non-Seismic Applications: Use resilient material isolator hangers.
 - 4. Floor-Mounted Piping, Non-Seismic Applications: Use open (unhoused) spring isolators.
 - 5. Use modular seal or approved resilient material where vibration-isolated piping penetrates building elements (e.g. walls, floors) arranged to prevent vibration transmission to structure.

2.02 MANUFACTURERS

- A. Kinetics Noise Control, Inc: www.kineticsnoise.com.
- B. Mason Industries: www.mason-ind.com.

2.03 VIBRATION ISOLATORS

- A. Manufacturers:
 - 1. Vibration Isolators:
 - a. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
 - b. Mason Industries: www.mason-ind.com/#sle.
 - 2. Source Limitations: Furnish vibration-isolators and associated accessories produced by a single manufacturer and obtained from a single supplier.
- B. General Requirements:
 - 1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
 - 2. Spring Elements for Spring Isolators:
 - a. Color code or otherwise identify springs to indicate load capacity.
 - b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
 - c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
 - d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
 - e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
 - f. Selected to function without undue stress or overloading.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.

- B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Secure fasteners according to manufacturer's recommended torque settings.
- D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- E. Vibration Isolation Systems:
 - 1. Spring Isolators:
 - a. Position equipment at operating height; provide temporary blocking as required.
 - b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
 - c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
 - 2. Isolator Hangers:
 - a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
 - b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
 - 3. Clean debris from beneath vibration-isolated equipment that could cause short circuiting of isolation.
 - 4. Use elastomeric grommets for attachments where required to prevent short circuiting of isolation.
 - 5. Adjust isolators to be free of isolation short circuits during normal operation.
 - 6. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect vibration isolation and/or seismic control components for damage and defects.
- C. Vibration Isolation Systems:
 - 1. Verify isolator static deflections.
 - 2. Verify required clearance beneath vibration-isolated equipment support bases.
 - 3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.
- D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION

SECTION 230553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Adhesive-backed duct markers.
- D. Pipe markers.

1.02 RELATED REQUIREMENTS

- A. Section 099123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2025.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.
- E. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS**2.01 IDENTIFICATION APPLICATIONS**

- A. Air Handling Units: Nameplates.
- B. Air Terminal Units: Tags.
- C. Automatic Controls: Tags. Key to control schematic.
- D. Control Panels: Nameplates.
- E. Ductwork: Duct Markers.
- F. Instrumentation: Tags.
- G. Major Control Components: Nameplates.
- H. Piping: Pipe markers.
- I. Pumps: Nameplates.
- J. Small-sized Equipment: Tags.
- K. Tanks: Nameplates.
- L. Thermostats: Nameplates.
- M. Valves: Tags.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com/#sle.
 - 2. Brimar Industries, Inc.: www.pipemarker.com.
 - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 4. Seton Identification Products, a Tricor Direct Company: www.seton.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Letter Color: White.

- C. Letter Height: 1/4 inch (6 mm).
- D. Background Color: Black.
- E. Plastic: Comply with ASTM D709.

2.03 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com/#sle.
 - 2. Brady Corporation: www.bradycorp.com/#sle.
 - 3. Brimar Industries, Inc.: www.pipemarker.com.
 - 4. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 5. Seton Identification Products, a Tricor Company: www.seton.com/#sle.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 ADHESIVE-BACKED DUCT MARKERS

- A. Manufacturers:
 - 1. Brimar Industries, Inc.: www.pipemarker.com.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch (0.76 mm); printed with UV and chemical resistant inks.

2.05 PIPE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com/#sle.
 - 2. Brimar Industries, Inc.: www.pipemarker.com.
 - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 4. MIFAB, Inc: www.mifab.com/#sle.
 - 5. Seton Identification Products, a Tricor Company: www.seton.com/#sle.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Color: Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.
- F. Color code as follows:
 - 1. Heating, Cooling, and Boiler Feedwater: Green with white letters.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Apply stencil painting in accordance with Section 099123.
- D. Install plastic pipe markers in accordance with manufacturer's instructions.

- E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- F. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- G. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
- H. Identify service, flow direction, and pressure.
- I. Install in clear view and align with axis of piping.
- J. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- K. Install ductwork with duct markers. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of refrigerating systems.
- C. Field quality-control testing of Laboratory fume hoods.
- D. Measurement of final operating condition of HVAC systems.

1.02 RELATED REQUIREMENTS

- A. Section 014000 - Quality Requirements: Employment of testing agency and payment for services.

1.03 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2024, with Errata (2025).
- C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Submit to Engineer/Architect.
 - 2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
 - 3. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Engineer/Architect and other installers to sufficiently understand the design intent for each system.
 - 4. Include at least the following in the plan:
 - a. Preface: An explanation of the intended use of the control system.
 - b. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - c. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - d. Identification and types of measurement instruments to be used and their most recent calibration date.
 - e. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - f. Final test report forms to be used.
 - g. Detailed step-by-step procedures for TAB work for each system and issue, including:
 - 1) Terminal flow calibration (for each terminal type).
 - 2) Diffuser proportioning.
 - 3) Branch/submain proportioning.
 - 4) Total flow calculations.
 - 5) Rechecking.
 - 6) Diversity issues.
 - h. Expected problems and solutions, etc.
 - i. Details of how TOTAL flow will be determined; for example:
 - 1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
 - 2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.

- j. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
 - k. Confirmation of understanding of the outside air ventilation criteria under all conditions.
 - l. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
 - m. Method of checking building static and exhaust fan and/or relief damper capacity.
 - n. Methods for making coil or other system plant capacity measurements, if specified.
 - o. Time schedule for TAB work to be done in phases (by floor, etc.).
 - p. Time schedule for deferred or seasonal TAB work, if specified.
 - q. False loading of systems to complete TAB work, if specified.
 - r. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
 - s. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
 - t. Procedures for formal progress reports, including scope and frequency.
 - u. Procedures for formal deficiency reports, including scope, frequency and distribution.
- D. Field Quality-control Testing of Laboratory Fume Hoods:
- 1. Product Data sheets for all equipment proposed for use in on-site as-installed testing.
 - 2. Sample Test Report.
 - 3. List of laboratory fume hoods to be tested. Submit a minimum of one week prior to commencement of testing.
- E. Field Logs: Submit at least once a week to the Construction Manager.
- F. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- G. Progress Reports.
- H. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- 1. Submit under provisions of Section 014000.
 - 2. Submit to the the Construction Manager and HVAC controls contractor within two weeks after completion of testing, adjusting, and balancing.
 - 3. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 4. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer/Architect and for inclusion in operating and maintenance manuals.
 - 5. Provide reports in electronic format, complete with index page and indexing tabs, with cover identification. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
 - 6. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 7. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 8. Units of Measure: Report data in I-P (inch-pound) units only.
 - 9. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Engineer/Architect.
 - g. Project Engineer.
 - h. Project Contractor.
 - i. Report date.
- I. Project Record Documents: Record actual locations of balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 GENERAL REQUIREMENTS**

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
 - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of three years documented experience.
 - 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
 - 1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Engineer/Architect to facilitate spot checks during testing.
- C. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.

- B. Air Outlets and Inlets: Adjust total to within plus 5 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- L. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.07 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Plumbing Pumps.
 - 2. Air Cooled Refrigerant Condensers.
 - 3. Packaged Roof Top Heating/Cooling Units.
 - 4. Computer Room Air Conditioning Units.
 - 5. Air Handling Units.
 - 6. Fans.
 - 7. Air Terminal Units.

8. Air Inlets and Outlets.

3.08 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer.
 - 2. Model/Frame.
 - 3. HP/BHP.
 - 4. Phase, voltage, amperage; nameplate, actual, no load.
 - 5. RPM.
 - 6. Service factor.
 - 7. Starter size, rating, heater elements.
 - 8. Sheave Make/Size/Bore.
- B. V-Belt Drives:
 - 1. Identification/location.
 - 2. Required driven RPM.
 - 3. Driven sheave, diameter and RPM.
 - 4. Belt, size and quantity.
 - 5. Motor sheave diameter and RPM.
 - 6. Center to center distance, maximum, minimum, and actual.
- C. Pumps:
 - 1. Identification/number.
 - 2. Manufacturer.
 - 3. Size/model.
 - 4. Impeller.
 - 5. Service.
 - 6. Design flow rate, pressure drop, BHP.
 - 7. Actual flow rate, pressure drop, BHP.
 - 8. Discharge pressure.
 - 9. Suction pressure.
 - 10. Total operating head pressure.
 - 11. Shut off, discharge and suction pressures.
 - 12. Shut off, total head pressure.
- D. Air Cooled Condensers:
 - 1. Identification/number.
 - 2. Location.
 - 3. Manufacturer.
 - 4. Model number.
 - 5. Serial number.
 - 6. Entering DB air temperature, design and actual.
 - 7. Leaving DB air temperature, design and actual.
 - 8. Number of compressors.
- E. Cooling Coils:
 - 1. Identification/number.
 - 2. Location.
 - 3. Service.
 - 4. Manufacturer.
 - 5. Air flow, design and actual.
 - 6. Entering air DB temperature, design and actual.
 - 7. Entering air WB temperature, design and actual.
 - 8. Leaving air DB temperature, design and actual.
 - 9. Leaving air WB temperature, design and actual.
 - 10. Water flow, design and actual.
 - 11. Water pressure drop, design and actual.

12. Entering water temperature, design and actual.
 13. Leaving water temperature, design and actual.
 14. Air pressure drop, design and actual.
- F. Heating Coils:
1. Identification/number.
 2. Location.
 3. Service.
 4. Manufacturer.
 5. Air flow, design and actual.
 6. Water flow, design and actual.
 7. Water pressure drop, design and actual.
 8. Entering water temperature, design and actual.
 9. Leaving water temperature, design and actual.
 10. Entering air temperature, design and actual.
 11. Leaving air temperature, design and actual.
 12. Air pressure drop, design and actual.
- G. Air Moving Equipment:
1. Location.
 2. Manufacturer.
 3. Model number.
 4. Serial number.
 5. Arrangement/Class/Discharge.
 6. Air flow, specified and actual.
 7. Return air flow, specified and actual.
 8. Outside air flow, specified and actual.
 9. Total static pressure (total external), specified and actual.
 10. Inlet pressure.
 11. Discharge pressure.
 12. Sheave Make/Size/Bore.
 13. Number of Belts/Make/Size.
 14. Fan RPM.
- H. Outside Air:
1. Identification/location.
 2. Design air flow.
 3. Actual air flow.
 4. Design return air flow.
 5. Actual return air flow.
 6. Design outside air flow.
 7. Actual outside air flow.
 8. Return air temperature.
 9. Outside air temperature.
 10. Required air temperature
 11. Actual air temperature
- I. Exhaust Fans:
1. Location.
 2. Manufacturer.
 3. Model number.
 4. Serial number.
 5. Air flow, specified and actual.
 6. Total static pressure (total external), specified and actual.
 7. Inlet pressure.
 8. Discharge pressure.

9. Sheave Make/Size/Bore.
 10. Number of Belts/Make/Size.
 11. Fan RPM.
- J. Duct Traverses:
1. System zone/branch.
 2. Duct size.
 3. Area.
 4. Design velocity.
 5. Design air flow.
 6. Test velocity.
 7. Test air flow.
 8. Duct static pressure.
 9. Air temperature.
 10. Air correction factor.
- K. Duct Leak Tests:
- L. Flow Measuring Stations:
- M. Terminal Unit Data:
1. Manufacturer.
 2. Type, constant, variable, single, dual duct.
 3. Identification/number.
 4. Location.
 5. Model number.
 6. Size.
 7. Minimum static pressure.
 8. Minimum design air flow.
 9. Maximum design air flow.
 10. Maximum actual air flow.
 11. Inlet static pressure.
- N. Air Distribution Tests:
1. Air terminal number.
 2. Room number/location.
 3. Terminal type.
 4. Terminal size.
 5. Design air flow.
 6. Test (final) air flow.
 7. Percent of design air flow.

END OF SECTION

SECTION 230713
DUCT INSULATION**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Duct insulation.
- B. Duct liner.
- C. Insulation jackets.

1.02 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.
- C. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.
- D. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2025.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- G. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.06 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS**2.01 REGULATORY REQUIREMENTS**

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or ASTM E84.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. Knauf Insulation: www.knaufinsulation.com.
 - 2. Johns Manville: www.jm.com.
 - 3. Owens Corning Corporation: www.ocbuildingspec.com.
 - 4. CertainTeed Corporation: www.certainteed.com.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. 'K' ('Ksi') value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 250 degrees F (121 degrees C).
 - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
 - 3. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Tie Wire: Annealed steel, 16 gage, 0.0508 inch diameter (1.29 mm diameter).

2.03 JACKETS

- A. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
 - 1. Lagging Adhesive:
 - a. Compatible with insulation.

2.04 DUCT LINER

- A. Manufacturers:
 - 1. Knauf Insulation: www.knaufinsulation.com.
 - 2. Johns Manville: www.jm.com.
 - 3. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 - 4. CertainTeed Corporation: www.certainteed.com.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Note: Choose the liner type - Elastomeric Foam or Glass Fiber.
- C. Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; rigid board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
 - 1. Fungal Resistance: No growth when tested according to ASTM G21.
 - 2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F (0.045 at 24 degrees C).
 - 3. Service Temperature: Up to 250 degrees F (121 degrees C).
 - 4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm (25.4 m/s), minimum.
- D. Adhesive: Waterproof, fire-retardant type, ASTM C916.
- E. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. Insulated ducts conveying air above ambient temperature:
 - 1. Provide with or without standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor ((below 3 meters above finished floor)): Finish with canvas jacket sized for finish painting.
- F. External Duct Insulation Application:
 - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Secure insulation without vapor barrier with staples, tape, or wires.
 - 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- G. Duct and Plenum Liner Application:
 - 1. Adhere insulation with adhesive for 100 percent coverage.
 - 2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
 - 3. Seal and smooth joints. Seal and coat transverse joints.
 - 4. Seal liner surface penetrations with adhesive.
 - 5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

END OF SECTION

SECTION 230800
COMMISSIONING OF HVAC**PART 1 GENERAL****1.01 SUMMARY**

- A. See Section 019113 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 019113.
- B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.
- C. The Commissioning Provider (CxP) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.
- D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:
 - 1. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.
- E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.02 REFERENCE STANDARDS

- A. ASHRAE Guideline 1.1 - Application of the Commissioning Process to New HVAC&R Systems; 2025.

1.03 SUBMITTALS

- A. Updated Submittals: Keep Commissioning Provider (CxP) informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.
- B. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Provider.
- C. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
 - 1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
 - 2. Full as-built set of control drawings.
 - 3. Full as-built sequence of operations for each piece of equipment.
 - 4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
 - a. Floor.
 - b. Room number.
 - c. Room name.
 - d. Air handler unit ID.
 - e. Reference drawing number.
 - f. Air terminal unit tag ID.
 - g. Heating and/or cooling valve tag ID.
 - h. Minimum air flow rate.
 - i. Maximum air flow rate.
 - 5. Full print out of all schedules and set points after testing and acceptance of the system.
 - 6. Full as-built print out of software program.
 - 7. Electronic copy on disk of the entire program for this facility.
 - 8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.

9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
10. Control equipment component submittals, parts lists, etc.
11. Warranty requirements.
12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
 - a. Sequences of operation.
 - b. Control drawings.
 - c. Points lists.
 - d. Controller and/or module data.
 - e. Thermostats and timers.
 - f. Sensors and DP switches.
 - g. Valves and valve actuators.
 - h. Dampers and damper actuators.
 - i. Program setups (software program printouts).
- D. Project Record Documents: See Section 017800 for additional requirements.
 1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
 2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.
- E. Draft Training Plan: In addition to requirements specified in Section 017900, include:
 1. Follow the recommendations of ASHRAE Guideline 1.1.
 2. Control system manufacturer's recommended training.
 3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.
- F. Training Manuals: See Section 017900 for additional requirements.
 1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.01 PREPARATION

- A. Cooperate with CxP in development of the Prefunctional Checklists and Functional Test Procedures.
- B. Furnish additional information requested by CxP.
- C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by CxP; update the schedule as appropriate.
- D. Notify CxP when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction, notify ahead of time and be proactive in seeing that CxP has the scheduling information needed to efficiently execute the commissioning process.

- E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.
- F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.
- G. Provide temperature and pressure taps in accordance with Contract Documents.

3.02 INSPECTING AND TESTING - GENERAL

- A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.
- B. Perform the Functional Tests directed by CxP for each item of equipment or other assembly to be commissioned.
- C. Provide two-way radios for use during the testing.
- D. Valve/Damper Stroke Setup and Check:
 - 1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
 - 2. Set pump/fan to normal operating mode.
 - 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
 - 4. Command valve/damper open; verify position is full open and adjust output signal as required.
 - 5. Command valve/damper to a few intermediate positions.
 - 6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

3.03 TAB COORDINATION

3.04 CONTROL SYSTEM FUNCTIONAL TESTING

- A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.
- B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.
- C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by CxP.
- D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.
 - 1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.
 - 2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.
- E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.
- F. Demonstrate the following to CxP during testing of controlled equipment; coordinate with commissioning of equipment.
 - 1. Setpoint changing features and functions.
 - 2. Sensor calibrations.
- G. Demonstrate to CxP:
 - 1. That all specified functions and features are set up, debugged and fully operable.
 - 2. That scheduling features are fully functional and setup, including holidays.
 - 3. That all graphic screens and value readouts are completed.
 - 4. Correct date and time setting in central computer.

5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
 6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.
 7. Power failure and battery backup and power-up restart functions.
 8. Global commands features.
 9. Security and access codes.
 10. Occupant over-rides (manual, telephone, key, keypad, etc.).
 11. O&M schedules and alarms.
 12. Occupancy sensors and controls.
 13. All control strategies and sequences not tested during controlled equipment testing.
- H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.05 OPERATION AND MAINTENANCE MANUALS

- A. See Section 017800 for additional requirements.
- B. Add design intent documentation furnished by Engineer/Architect to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Provider for review; make changes recommended by Commissioning Provider.
- D. Commissioning Provider will add commissioning records to manuals after submission to Owner.

3.06 DEMONSTRATION AND TRAINING

- A. See Section 017900 for additional requirements.
- B. Demonstrate operation and maintenance of HVAC system to Owner's personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.
- C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to CxP during Functional Testing.
- D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:
- E. TAB Review: Instruct Owner's personnel for minimum ____ hours, after completion of TAB, on the following:
 1. Review final TAB report, explaining the layout and meanings of each data type.
 2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
 3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
 4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
 5. Other salient information that may be useful for facility operations, relative to TAB.
- F. HVAC Control System Training: Perform training in at least three phases:
 1. Phase 1 - Basic Control System: Provide minimum of ____ hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
 - a. This training may be held on-site or at the manufacturer's facility.
 - b. If held off-site, the training may occur prior to final completion of the system installation.

- c. For off-site training, Contractor shall pay expenses of up to two attendees.
- 2. Phase 2 - Integrating with HVAC Systems: Provide minimum of ____ hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:
 - a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
 - b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
 - c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
 - d. Every display screen, allowing time for questions.
 - e. Point database entry and modifications.
- 3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of ____ hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.
- G. Provide the services of manufacturer representatives to assist instructors where necessary.
- H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

SECTION 230913
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Control panels.
- B. Control Valves:
 - 1. Electronic operators.
- C. Damper Operators:
 - 1. Electric operators.
- D. Humidistats:
 - 1. Room humidistats.
 - 2. Limit duct humidistats.
- E. Input/Output Sensors:
 - 1. Temperature sensors.
 - 2. Static pressure (air pressure) sensors.
 - 3. Equipment operation (current) sensors.
 - 4. Damper position indicators.
 - 5. Carbon dioxide sensors.
- F. Thermostats:
 - 1. Electric room thermostats.
 - 2. Room thermostat accessories.
 - 3. Immersion thermostats.
 - 4. Airstream thermostats.
- G. Time clocks.
- H. Transmitters:
 - 1. Air pressure transmitters.
 - 2. Water pressure transmitters (liquid differential pressure transmitters).
 - 3. Temperature transmitters.
 - 4. Humidity transmitters.
- I. Flow Sensors:
 - 1. Flow switches.

1.02 REFERENCE STANDARDS

- A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.
- B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- C. NEMA BS 31032 - Residential Controls—Electrical Wall-Mounted Room Thermostats; 2025.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
- C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and

pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

- D. Samples: Submit two of each type of room thermostat and cover, thermostat guard, and each exposed control component.
- E. Manufacturer's Instructions: Provide for all manufactured components.
- F. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
- G. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
 - 1. Revise shop drawings to reflect actual installation and operating sequences.
- H. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience approved by manufacturer.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Seimens Talon.
- B. Substitutions: See Section 016000 - Product Requirements.

2.02 EQUIPMENT - GENERAL

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.03 CONTROL PANELS

- A. NEMA EN 10250, general purpose utility enclosures with enameled finished face panel.
- B. Provide common keying for all panels.

2.04 CONTROL VALVES

- A. Two way modulating valves shall be characterized type rated for design flow at 1 psi. Valve shall have integral pressure/temperature ports.
- B. Three way valves shall have linear characteristics
- C. Rate for service pressure of 200 psi at 250 degrees F.
 - 1. Up to 2 inches (50 mm): Bronze body, bronze trim, rising stem, renewable composition disc, screwed ends with backseating capacity repackable under pressure.
 - 2. Over 2 inches (50 mm): Iron body, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc.
- D. Electronic Operators:
 - 1. Compatible with control system.

2.05 DAMPERS

- A. Performance: Test in accordance with AMCA 500-D.
- B. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gage, 0.1046 inch (2.66 mm).
- C. Blades: Galvanized steel, maximum blade size 8 inches (200 mm) wide, 48 inches (1200 mm) long, minimum 22 gage, 0.0299 inch (0.76 mm), attached to minimum 1/2 inch (13 mm) shafts with set screws.
- D. Blade Seals: Synthetic elastomeric, inflatable, mechanically attached, field replaceable.
- E. Jamb Seals: Spring stainless steel.
- F. Shaft Bearings: Oil impregnated sintered bronze.
- G. Linkage Bearings: Oil impregnated sintered bronze.
- H. Leakage: Less than one percent based on approach velocity of 2000 ft per min (10 m per sec) and 4 inches wg (1.0 kPa).
- I. Maximum Pressure Differential: 6 inches wg (1.5 kPa).
- J. Temperature Limits: Minus 40 to 200 degrees F (Minus 40 to 93 degrees C).

2.06 DAMPER OPERATORS

- A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
 - 1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
 - 2. Provide one operator for maximum 36 sq ft (3.34 sq m) damper section.
- B. Electric Operators:
 - 1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

2.07 HUMIDISTATS

- A. Room Humidistats:
 - 1. Wall mounted, proportioning type.
 - 2. Throttling Range: Adjustable 2 percent relative humidity.
 - 3. Operating Range: 30 to 80 percent.
 - 4. Maximum Temperature: 110 degrees F (43 degrees C).
 - 5. Cover: Concealed setpoint.
- B. Limit Duct Humidistats:
 - 1. Insertion, two position type.
 - 2. Throttling Range: Adjustable 2 percent relative humidity.
 - 3. Operating Range: 20 to 80 percent.
 - 4. Maximum Temperature: 150 degrees F (65 degrees C).

2.08 INPUT/OUTPUT SENSORS

- A. Temperature Sensors:
 - 1. Manufacturers:
 - a. Seimens Talon.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
 - 3. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F (26 degrees C).
 - 4. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
 - 5. Temperature Sensing Device: Compatible with project DDC controllers.
 - 6. Performance Characteristics:

- a. RTD:
 - 1) Room Sensor Accuracy: Plus/minus 0.50 degrees F (0.28 degrees C) minimum.
 - 2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F (0.28 degrees C) minimum.
 - 3) All Other Accuracy: Plus/minus 0.75 degrees F (0.42 degrees C) minimum.
 - 4) Range: Minus 40 degrees F (Minus 40 degrees C) through 220 degrees F (104.4 degrees C) minimum.
 - b. Thermistor:
 - 1) Accuracy (All): Plus/minus 0.36 degrees F (0.20 degrees C) minimum.
 - 2) Range: Minus 25 degrees F (Minus 13 degrees C) through 122 degrees F (50 degrees C) minimum.
 - 3) Heat Dissipation Constant: 2.7 mW per degree C.
 - c. Temperature Transmitter:
 - 1) Accuracy: 0.10 degree F (0.06 degrees C) minimum or plus/minus 0.20 percent of span.
 - 2) Output: 4 to 20 mA.
 - d. Sensing Range:
 - 1) Provide extended range sensors if required to sense the range expected for a respective point.
 - 2) Use temperature transmitters in conjunction with RTD's when RTD's are incompatible with DDC controller direct temperature input.
 - e. Wire Resistance:
 - 1) Use appropriate wire size to limit temperature offset due to wire resistance to 1.0 degree F (0.56 degrees C) or use temperature transmitter when offset is greater than 1.0 degree F (0.56 degrees C) due to wire resistance.
 - 2) Compensate for wire resistance in software input definition when feature is available in the DDC controller.
 - f. Immersion Temperature Sensors: A sensor encased in a corrosion-resistant probe with an indoor junction box service entry body.
 - g. Room Temperature Sensors with Integral Digital Display:
 - 1) Construct for surface.
 - 2) Provide a four button keypad with the following capabilities:
 - (a) Indication of space temperature.
 - (b) Setpoint adjustment to accommodate room setpoint, DDC Input/Output Points List, and Sequence of Operation.
 - (c) Display and control fan operation status.
 - (d) Manual occupancy override and indication of occupancy status.
 - (e) Controller mode status.
 - (f) Password enabled setpoint and override modes.
 - h. Insertion Elements:
 - 1) Use in ducts not affected by temperature stratification or smaller than 11 sq inches (1 sq m).
 - 2) Provide dry type, insertion elements for liquids, installed in immersion wells, with minimum insertion length of 2.5 inches (60 mm).
- B. Humidity Sensors:
- 1. Manufacturers:
 - a. Seimens Talon.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. Duct Mounted Sensor: Voltage type encased in a die-cast metal, weather-proof housing.
 - a. Humidity:
 - 1) HS Element: Digitally profiled thin-film capacitive.
 - 2) Accuracy 1 percent at 10 to 80 percent relative humidity at 77 degrees F (25 degrees C), multi-point calibration, NIST traceable.
 - (a) Plus/minus 1 percent at 20 to 40 percent RH in mA output mode; (multi-point calibration, NIST traceable).

- 3) Scaling: 0 to 100 percent RH.
 - b. Temperature Effect:
 - 1) Duct Mounted: Plus/minus 0.18 percent per degree F (Plus/minus 0.10 percent per degree C).
 - c. Hysteresis: 1.5 percent typical.
 - d. Linearity: Included in accuracy specification.
 - e. Reset Rate: 24 hours.
 - f. Stability: Plus/minus 1 percent at 68 degrees F (20 degrees C) annually, for two years.
 - g. Temperature Monitoring:
 - 1) Temperature Transmitter Output: Digital, 4 to 20mA (clipped and capped) or 0-5V/0-10V output.
 - (a) HD Transmitter Accuracy: Plus/minus 1.0 degree F (Plus/minus 0.5 degrees C).
 - h. Operating Environment:
 - 1) Operating Humidity Range: 0 to 100 percent RH noncondensing.
 - 2) Operating Temperature Range: Minus 40 degrees F (Minus 40 degrees C) to 122 degrees F (50 degrees C).
 - 3. Wall Mounted Sensor: Milliamp type encased in a High impact ABS plastic housing.
- C. Static Pressure (Air Pressure) Sensors:
- 1. Manufacturers:
 - a. Siemens Talon.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
 - 3. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F (5 to 40 degrees C).
 - 4. Accuracy: One percent of full scale with repeatability 0.3 percent.
 - 5. Output: 0 to 5 vdc with power at 12 to 28 vdc.
- D. Equipment Operation (Current) Sensors:
- 1. Manufacturers:
 - a. Siemens Talon.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. Status Inputs for Fans: Differential pressure switch with adjustable range of 0 to 5 inches wg (0 to 1250 Pa).
 - 3. Status Inputs for Pumps: Differential pressure switch piped across pump with adjustable pressure differential range of 8 to 60 psi (50 to 400 kPa).
 - 4. Status Inputs for Electric Motors: Current sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.
- E. Damper Position Indicators: Potentiometer mounted in enclosure with adjustable crank arm assembly connected to damper to transmit 0 to 100 percent damper travel.
- F. Carbon Dioxide Sensors, Duct and Wall:
- 1. Manufacturers:
 - a. Siemens Talon.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. General: Provide non-dispersive infrared (NDIR), diffusion sampling CO2 sensors with integral transducers and linear output.
 - 3. Air Temperature: Range of 32 to 122 degrees F (0 to 50 degrees C).
 - 4. Relative Humidity: Range of 0 to 95 percent (non-condensing).
 - 5. Power Input: Class 2; 12 to 30VDC or 24VAC 50/60 Hz; 100mA max.
 - 6. Calibration Characteristics:
 - a. Automatically compensating algorithm for sensor drift due to sensor degradation.
 - b. Maximum Drift: 2 percent.
 - c. User calibratable with a minimum calibration interval of 5 years.
 - 7. Construction:

- a. Sensor Chamber: Non-corrosive material for neutral effect on carbon dioxide sample.
- b. Provide duct mounted sensors with duct probe designed to protect sensing element from dust accumulation and mechanical damage.
- c. Housing: High impact plastic.
- 8. Optional Equipment
 - a. Temperature Sensor:
 - 1) Solid state, integrated circuit; Accuracy: Plus/minus 1 degree F (0.5 degrees C); Resolution: 0.2 degrees F (0.1 degrees C); Output Range: 50 to 95 degrees F (10 to 35 degrees C).

2.09 THERMOSTATS

- A. Electric Room Thermostats:
 - 1. Manufacturers:
 - a. Siemens Talon.
 - 2. Type: NEMA BS 31032, 24 volts, with setback/setup temperature control.
 - 3. Service: Cooling and heating.
 - 4. Covers: Locking with set point adjustment, with thermometer.
- B. Room Thermostat Accessories:
 - 1. Thermostat Covers: Brushed aluminum.
 - 2. Insulating Bases: For thermostats located on exterior walls.
 - 3. Thermostat Guards: Metal mounted on separate base.
- C. Immersion Thermostats:
 - 1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint and adjustable throttling range.
- D. Airstream Thermostats:
 - 1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.
 - 2. Averaging service remote bulb element: 7.5 feet (2.3 m).

2.10 TIME CLOCKS

- A. Seven day programming switch timer with synchronous timing motor and seven day dial, continuously charged Ni-cad battery driven power failure 8 hour carry over and multiple switch trippers to control systems for minimum of two and maximum of eight signals per day with two normally open and two normally closed output switches.
- B. Solid state programmable time control with 2 separate programs, 24 hour battery carry over, 365 day calendar with 20 programmable holidays.

2.11 TRANSMITTERS

- A. Pressure Transmitters:
 - 1. Manufacturers:
 - a. Siemens Talon.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. One pipe direct acting indicating type for gas, liquid, or steam service, range suitable for system, proportional electronic output.
- B. Air Pressure Transmitters:
 - 1. Manufacturers:
 - a. Siemens Talon.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. General: Provide dry media differential pressure transducers to monitor duct pressure.
 - a. Media Compatibility: Dry air.
 - b. Input Power: Class 2; 12 to 30 VDC; 2-wire: 20 mA max.
 - c. Output: Field selectable, 2-wire, loop-powered 4 to 20 mA (DC only, clipped and capped).
 - d. Pressure Ranges: 4 and 7, field selectable.

- e. Response Time:
 - 1) Fast: T95 in 2 seconds.
 - f. Mode: Switch selectable, unidirectional.
 - g. Proof Pressure (pressure differential): 3 psid (20.6 kPa).
 - h. Burst Pressure (pressure differential): 5 psid (34.5 kPa).
 - i. Accuracy: Plus/minus 1 percent f.s. (full scale) of selected range (combined linearity & hysteresis).
 - j. Temperature Effect (per transmitter size):
 - 1) 1 inch w.c. (250 Pa): 2.0 percent per degree C.
 - 2) 10 inch w.c. (2.5 kPa): 0.01 percent per degree C.; (Relative to 25 degrees C) 32 degrees F (0 degrees C) to 122 degrees F (50 degrees C).
 - k. Zero Drift (1-year) (per transmitter size):
 - 1) 1 inch w.c. (250 Pa): 2 percent maximum.
 - 2) 10 inch (2.5 kPa): 0.05 percent maximum.
 - l. Zero adjust: Pushbutton auto-zero and digital input (2-pos terminal block).
 - m. Operating Environment:
 - 1) 32 degrees F (0 degrees C) to 140 degrees F (60 degrees C).
 - 2) 0 to 90 percent RH noncondensing.
 - n. Fittings:
 - 1) Brass barb.
 - 2) 0.24 inches (6.1 mm) outer diameter.
- C. Water Pressure Transmitters (Liquid Differential Pressure Transmitters):
- 1. Manufacturers:
 - a. Siemens Talon.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. General: Provide wet media differential pressure transducers with 6 ft (1.83 m) armored cable, to allow remote pressure sensing capability using existing plumbing runs.
 - a. Input Power: Class 2; 15 to 30 VDC, 24VAC nominal, 50/60 Hz.
 - b. Maximum Current Draw:
 - 1) DC: 125 mA.
 - 2) AC: 280 mA.
 - c. Output: 3-wire transmitter; user-selectable, 4 to 20 mA (0 to 5V/0 to 10V).
 - d. Sensor:
 - 1) Media Compatibility: 17 to 4 PH stainless steel.
 - 2) Status Indication: Dual color LED.
 - 3) Proof Pressure: 2x max. F.S. range.
 - 4) Burst Pressure: 5x max. F.S. range.
 - 5) Accuracy at 77 degrees F (25 degrees C) for less than or equal 20 ft (6.1 m):
 - (a) Ranges A and B: Plus/minus 1 percent F.S. typical.
 - (b) Range C: Plus/minus 1.5 percent F.S. typical.
 - (c) Range D: Plus/minus 2 percent F.S. typical.
 - 6) Surge Damping: Electronic; 1 second averaging.
 - 7) Long Term Stability: Plus/minus 0.25 percent.
 - 8) Zero Offset (Bidirectional and Port Swap Modes Only): 0.5 percent.
 - e. Reverser:
 - 1) Zero Adjust: Push button auto-zero and digital input (2-position terminal block).
 - 2) Fittings:
 - (a) 27 NPT (28 BSP) female thread, stainless steel 17 to 4 PH.
 - f. Pressure Ranges:
 - 1) 0 psi (0 kPa) to 50 psi (345 kPa) (Gauge): 5 psid (34.5 kPa)/10 psid (68.9 kPa)/25 psid (172.4 kPa)/50 psid (344.7 kPa) (pressure differential).

- 2) 0 psi (0 kPa) to 100 psi (690 kPa) (Gauge): 10 psid (68.9 kPa)/20 psid (137.9 kPa)/50 psid (344.7 kPa)/100 psid (689.5 kPa) (pressure differential).
 - 3) 0 psi (0 kPa) to 250 psi (1724 kPa) (Gauge): 25 psid (172.4 kPa)/50 psid (172.4 kPa)/125 psid (861.8 kPa)/250 psid (1723.7 kPa) (pressure differential).
 - g. Operating Conditions:
 - 1) Temperature Compensated Range:
 - (a) 32 degrees F (0 degrees C).
 - (b) TC Zero less than 1.5 percent of product F.S. (full scale) per sensor.
 - (c) TC Span less than 1.5 percent of product F.S. (full scale) per sensor.
 - 2) Sensor Operating Range: Minus 4 degrees F (Minus 20 degrees C) to 185 degrees F (85 degrees C).
 - 3) Operating Environment: 14 degrees F (Minus 10 degrees C) to 122 degrees F (50 degrees C); 10 to 90 percent RH noncondensing.
 - h. Enclosure: NEMA EN 10250, Type 4.
- D. Temperature Transmitters:
1. Manufacturers:
 - a. Siemens Talon.
 - b. Substitutions: See Section 016000 - Product Requirements.
- E. Humidity Transmitters:
1. Manufacturers:
 - a. Siemens Talon.
 - b. Substitutions: See Section 016000 - Product Requirements.
 2. One pipe, directly proportioned output signal to measured variable, linearity within plus or minus 1 percent for 70 percent relative humidity span, capable of withstanding 95 percent relative humidity without loss of calibration.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that systems are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.
- D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.
- F. Ensure installation of components is complementary to installation of similar components.
- G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of exposed control sensors with plans and room details before installation. Locate 48 inches (1200 mm) above floor. Align with lighting switches controllers. Refer to Section 262726.
- C. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.
- D. Provide guards on thermostats in public areas.
- E. Provide valves with position indicators and with pilot positioners where sequenced with other controls.

- F. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors. Provide separate minimum outside air damper section adjacent to return air dampers with separate damper motor.
- G. Provide isolation (two position) dampers of parallel blade construction.
- H. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.
- I. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.
- J. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements.

3.03 MAINTENANCE

- A. Provide service and maintenance of control system for one year from Date of Substantial Completion.
- B. Provide complete service of controls systems, including call backs, and submit written report of each service call.
- C. In addition to normal service calls, make minimum of 4 complete normal inspections of approximately 4 hours duration to inspect, calibrate, and adjust controls.

END OF SECTION

SECTION 230923
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. System description.
- B. Operator interface.
- C. Power supplies and line filtering.
- D. System software.
- E. Controller software.
- F. HVAC control programs.

1.02 REFERENCE STANDARDS

- A. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for each system component and software module.
- C. Shop Drawings:
 - 1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
 - 2. List connected data points, including connected control unit and input device.
 - 3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
 - 4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
 - 5. Indicate description and sequence of operation of operating, user, and application software.
- D. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.
- E. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
 - 1. Revise shop drawings to reflect actual installation and operating sequences.
 - 2. Include submittals data in final "Record Documents" form.
- F. Operation and Maintenance Data:
 - 1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
 - 2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
 - 3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
- G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with NFPA 70.

- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of experience.
- D. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Substantial Completion.
- C. Provide five year manufacturer's warranty for field programmable micro-processor based units.

1.07 PROTECTION OF SOFTWARE RIGHTS

- A. Prior to delivery of software, the Owner and the party providing the software will enter into a software license agreement with provisions for the following:
 - 1. Limiting use of software to equipment provided under these specifications.
 - 2. Limiting copying.
 - 3. Preserving confidentiality.
 - 4. Prohibiting transfer to a third party.

1.08 MANUFACTURERS

- A. Siemens Talon.
- B. Substitutions: See Section 016000 - Product Requirements.

1.09 SYSTEM DESCRIPTION

- A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.
- B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.
- C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.
- D. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 230913.
- E. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.
- F. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

1.10 OPERATOR INTERFACE

- A. PC Based Work Station:
 - 1. Resides on high speed network with building controllers.
 - 2. Connected to server for full access to all system information.
- B. Workstation, controllers, and control backbone to communicate using BACnet protocol and addressing.
- C. BACnet protocol to comply with ASHRAE Std 135.
- D. Hardware:
 - 1. Desktop:
 - a. Computer(s) and display(s) to be provided by DDC controls manufacturer.
 - b. Quantity: Provide allowance for 1 computer(s).
 - c. Location(s): As directed by the Owner.
 - d. Network Connection:

- 1) Ethernet interface card.
2. Laptop:
 - a. Laptop(s) to be provided by DDC controls manufacturer.
 - b. Quantity: Provide allowance for 1 computer(s).
 - c. Network Connection:
 - 1) Ethernet interface card.
3. Hand Held Device:
 - a. Provide remote system access via iPad or Smart Phone with browser agnostic connectivity, including controller point monitor and control access to the following data:
 - 1) Alarm.
 - 2) Summary.
 - 3) Schedule.
 - 4) Trend.
 - b. Provide the capability to view in text list based format.
 - c. Minimum Functionality:
 - 1) Set point adjustment.
 - 2) Alarm acknowledgement.
 - 3) Scheduling.

1.11 CONTROLLERS

A. BUILDING CONTROLLERS

- a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.
- b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
- c. Share data between networked controllers.
- d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
- e. Utilize real-time clock for scheduling.
- f. Continuously check processor status and memory circuits for abnormal operation.
- g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
- h. Communication with other network devices to be based on assigned protocol.
- i. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
- j. Perform routing when connected to a network of custom application and application specific controllers.
- k. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
- l. Outdoors and/or in Wet Ambient Conditions:
 - 1) Mount within waterproof enclosures.
 - 2) Rated for operation at 40 to 150 degrees F (4 to 65 degrees C).
- m. Conditioned Space:
 - 1) Mount within dustproof enclosures.
 - 2) Rated for operation at 32 to 120 degrees F (0 to 50 degrees C).
- n. Diagnostic LEDs for power, communication, and processor.
- o. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
- p. Maintain operation at 90 to 110 percent of nominal voltage rating.
- q. Perform orderly shutdown below 80 percent of nominal voltage.
- r. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet (1 m).

B. CUSTOM APPLICATION CONTROLLERS

- a. Provide sufficient memory to support controller's operating system, database, and programming requirements.
 - b. Share data between networked, microprocessor based controllers.
 - c. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
 - d. Utilize real-time clock for scheduling.
 - e. Continuously check processor status and memory circuits for abnormal operation.
 - f. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
 - g. Communication with other network devices to be based on assigned protocol.
 - h. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
 - i. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
 - j. Outdoors and/or in Wet Ambient Conditions:
 - 1) Mount within waterproof enclosures.
 - 2) Rated for operation at 40 to 150 degrees F (4 to 65 degrees C).
 - k. Conditioned Space:
 - 1) Mount within dustproof enclosures.
 - 2) Rated for operation at 32 to 120 degrees F (0 to 50 degrees C).
 - l. Diagnostic LED's for power, communication, and processor.
 - m. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
2. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
- a. Maintain operation at 90 to 110 percent of nominal voltage rating.
 - b. Perform orderly shutdown below 80 percent of nominal voltage.
 - c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet (1 m).

C. APPLICATION SPECIFIC CONTROLLERS

- a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
- b. Customized for operation within the confines of equipment served.
- c. Communication with other network devices to be based on assigned protocol.
- d. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
- e. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
- f. Outdoors and/or in Wet Ambient Conditions:
 - 1) Mount within waterproof enclosures.
 - 2) Rated for operation at 40 to 150 degrees F (4 to 65 degrees C).
- g. Conditioned Space:
 - 1) Mount within dustproof enclosures.
 - 2) Rated for operation at 32 to 120 degrees F (0 to 50 degrees C).
- h. Diagnostic LEDs for power, communication, and processor.
- i. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
- j. Maintain operation at 90 to 110 percent of nominal voltage rating.
- k. Perform orderly shutdown below 80 percent of nominal voltage.
- l. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 feet (1 m).

D. INPUT/OUTPUT INTERFACE

- a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.

- b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.
- c. Allow monitoring of On/Off signals from remote devices.
- d. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
- e. Sense dry contact closure with power provided only by the controller.
- f. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
- g. Outputs provided with three position (On/Off/Auto) override switches.
- h. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.
- i. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
- j. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
- k. Drift to not exceed 0.4 percent of range per year.
- l. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
- m. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
- n. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
- o. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.
- p. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

1.12 POWER SUPPLIES AND LINE FILTERING

- A. Power Supplies:
 - 1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
 - 2. Limit connected loads to 80 percent of rated capacity.
 - 3. Match DC power supply to current output and voltage requirements.
 - 4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.
 - 5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
 - 6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
 - 7. Operational Ambient Conditions: 32 to 120 degrees F (0 to 50 degrees C).
 - 8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD 810 for shock and vibration.
 - 9. Line voltage units UL recognized and CSA approved.
- B. Power Line Filtering:
 - 1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
 - 2. Minimum surge protection attributes:
 - a. Dielectric strength of 1000 volts minimum.
 - b. Response time of 10 nanoseconds or less.
 - c. Transverse mode noise attenuation of 65 dB or greater.
 - d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

1.13 LOCAL AREA NETWORK (LAN)

- A. Provide communication between control units over local area network (LAN).
- B. LAN Capacity: Not less than 60 stations or nodes.
- C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.
- D. LAN Data Speed: Minimum 19.2 Kb.

- E. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.
- F. Transmission Median: Fiber optic or single pair of solid 24 gage twisted, shielded copper cable.
- G. Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

1.14 SYSTEM SOFTWARE

- A. Operating System:
 - 1. Concurrent, multi-tasking capability.
 - a. Common Software Applications Supported: Microsoft Excel.
 - b. Acceptable Operating Systems: Windows.
 - 2. System Graphics:
 - a. Allow up to 10 graphic screens, simultaneously displayed for comparison and monitoring of system status.
 - b. Animation displayed by shifting image files based on object status.
 - c. Provide method for operator with password to perform the following:
 - 1) Move between, change size, and change location of graphic displays.
 - 2) Modify on-line.
 - 3) Add, delete, or change dynamic objects consisting of:
 - (a) Analog and binary values.
 - (b) Dynamic text.
 - (c) Static text.
 - (d) Animation files.
 - 3. Custom Graphics Generation Package:
 - a. Create, modify, and save graphic files and visio format graphics in PCX formats.
 - b. HTML graphics to support web browser compatible formats.
 - c. Capture or convert graphics from AutoCAD.
 - 4. Standard HVAC Graphics Library:
 - a. HVAC Equipment:
 - 1) Boilers.
 - 2) Air Handlers.
 - 3) Terminal HVAC Units.
 - 4) Fan Coil Units.
 - b. Ancillary Equipment:
 - 1) Fans.
 - 2) Pumps.
 - 3) Coils.
 - 4) Valves.
 - 5) Piping.
 - 6) Dampers.
 - 7) Ductwork.
 - c. File Format Compatible with Graphics Generation Package Program.
- B. Workstation System Applications:
 - 1. Automatic System Database Save and Restore Functions:
 - a. Current database copy of each Building Controller is automatically stored on hard disk.
 - b. Automatic update occurs upon change in any system panel.
 - c. In the event of database loss in any system panel, the first workstation to detect the loss automatically restores the database for that panel unless disabled by the operator.
 - 2. Manual System Database Save and Restore Functions by Operator with Password Clearance:
 - a. Save database from any system panel.
 - b. Clear a panel database.
 - c. Initiate a download of a specified database to any system panel.

3. Software provided allows system configuration and future changes or additions by operators under proper password protection.
4. On-line Help:
 - a. Context-sensitive system assists operator in operation and editing.
 - b. Available for all applications.
 - c. Relevant screen data provided for particular screen display.
 - d. Additional help available via hypertext.
5. Security:
 - a. Operator log-on requires user name and password to view, edit, add, or delete data.
 - b. System security selectable for each operator.
 - c. System supervisor sets passwords and security levels for all other operators.
 - d. Operator passwords to restrict functions accessible to viewing and/or changing system applications, editor, and object.
 - e. Automatic, operator log-off results from keyboard or mouse inactivity during user-adjustable, time period.
 - f. All system security data stored in encrypted format.
6. System Diagnostics:
 - a. Operations Automatically Monitored:
 - 1) Workstations.
 - 2) Printers.
 - 3) Modems.
 - 4) Network connections.
 - 5) Building management panels.
 - 6) Controllers.
 - b. Device failure is annunciated to the operator.
7. Alarm Processing:
 - a. All system objects are configurable to "alarm in" and "alarm out" of normal state.
 - b. Configurable Objects:
 - 1) Alarm limits.
 - 2) Alarm limit differentials.
 - 3) States.
 - 4) Reactions for each object.
8. Alarm Messages:
 - a. Descriptor: English language.
 - b. Recognizable Features:
 - 1) Source.
 - 2) Location.
 - 3) Nature.
9. Configurable Alarm Reactions by Workstation and Time of Day:
 - a. Logging.
 - b. Printing.
 - c. Starting programs.
 - d. Displaying messages.
 - e. Dialing out to remote locations.
 - f. Paging.
 - g. Providing audible annunciation.
 - h. Displaying specific system graphics.
10. Custom Trend Logs:
 - a. Definable for any data object in the system including interval, start time, and stop time.
 - b. Trend Data:
 - 1) Sampled and stored on the building controller panel.
 - 2) Archivable on hard disk.
 - 3) Retrievable for use in reports, spreadsheets and standard database programs.

- 4) Archival on LAN accessible storage media including hard disk, tape, Raid array drive, and virtual cloud environment.
 - 5) Protected and encrypted format to prevent manipulation, or editing of historical data and event logs.
11. Alarm and Event Log:
 - a. View all system alarms and change of states from any system location.
 - b. Events listed chronologically.
 - c. Operator with proper security acknowledges and clears alarms.
 - d. Alarms not cleared by operator are archived to the workstation hard disk.
12. Object, Property Status and Control:
 - a. Provide a method to view, edit if applicable, the status of any object and property in the system.
 - b. Status Available by the Following Methods:
 - 1) Menu.
 - 2) Graphics.
 - 3) Custom Programs.
13. Reports and Logs:
 - a. Reporting Package:
 - 1) Allows operator to select, modify, or create reports.
 - 2) Definable as to data content, format, interval, and date.
 - 3) Archivable to hard disk.
 - b. Real-time logs available by type or status such as alarm, lockout, normal, etc.
 - c. Stored on hard disk and readily accessible by standard software applications, including spreadsheets and word processing.
 - d. Set to be printed on operator command or specific time(s).
14. Reports:
 - a. Standard:
 - 1) Objects with current values.
 - 2) Current alarms not locked out.
 - 3) Disabled and overridden objects, points and SNVTs.
 - 4) Objects in manual or automatic alarm lockout.
 - 5) Objects in alarm lockout currently in alarm.
 - 6) Logs:
 - (a) Alarm History.
 - (b) System messages.
 - (c) System events.
 - (d) Trends.
 - b. Custom:
 - 1) Daily.
 - 2) Weekly.
 - 3) Monthly.
 - 4) Annual.
 - 5) Time and date stamped.
 - 6) Title.
 - 7) Facility name.
 - c. Tenant Override:
 - 1) Monthly report showing total, requested, after-hours HVAC and lighting services on a daily basis for each tenant.
 - 2) Annual report showing override usage on a monthly basis.
- C. Workstation Applications Editors:
 1. Provide editing software for each system application at PC workstation.
 2. Downloaded application is executed at controller panel.
 3. Full screen editor for each application allows operator to view and change:
 - a. Configuration.

- b. Name.
- c. Control parameters.
- d. Set-points.
- 4. Scheduling:
 - a. Monthly calendar indicates schedules, holidays, and exceptions.
 - b. Allows several related objects to be scheduled and copied to other objects or dates.
 - c. Start and stop times adjustable from master schedule.
- 5. Custom Application Programming:
 - a. Create, modify, debug, edit, compile, and download custom application programming during operation and without disruption of all other system applications.
 - b. Programming Features:
 - 1) English oriented language, based on BASIC, FORTRAN, C, or PASCAL syntax allowing for free form programming.
 - 2) Alternative language graphically based using appropriate function blocks suitable for all required functions and amenable to customizing or compounding.
 - 3) Insert, add, modify, and delete custom programming code that incorporates word processing features such as cut/paste and find/replace.
 - 4) Allows the development of independently, executing, program modules designed to enable and disable other modules.
 - 5) Debugging/simulation capability that displays intermediate values and/or results including syntax/execution error messages.
 - 6) Support for conditional statements (IF/THEN/ELSE/ELSE-F) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
 - 7) Support for floating-point arithmetic utilizing plus, minus, divide, times, square root operators; including absolute value; minimum/maximum value from a list of values for mathematical functions.
 - 8) Language consisting of resettable, predefined, variables representing time of day, day of the week, month of the year, date; and elapsed time in seconds, minutes, hours, and days where the variable values can be used in IF/THEN comparisons, calculations, programming statement logic, etc.
 - 9) Language having predefined variables representing status and results of the system software enables, disables, and changes the set points of the controller software.

1.15 CONTROLLER SOFTWARE

- A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.
- B. System Security:
 - 1. User access secured via user passwords and user names.
 - 2. Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
 - 3. User Log On/Log Off attempts are recorded.
 - 4. Automatic Log Off occurs following the last keystroke after a user defined delay time.
- C. Object or Object Group Scheduling:
 - 1. Weekly Schedules Based on Separate, Daily Schedules:
 - a. Include start, stop, optimal stop, and night economizer.
 - b. 10 events maximum per schedule.
 - c. Start/stop times adjustable for each group object.
 - 2. Exception Schedules:
 - a. Based on any day of the year.
 - b. Defined up to one year in advance.
 - c. Automatically discarded and replaced with standard schedule for that day of the week upon execution.
 - 3. Holiday or Special Schedules:

- a. Capability to define up to 99 schedules.
 - b. Repeated annually.
 - c. Length of each period is operator defined.
- D. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.
- E. Alarms:
 - 1. Binary object is set to alarm based on the operator specified state.
 - 2. Analog object to have high/low alarm limits.
 - 3. All alarming is capable of being automatically and manually disabled.
 - 4. Alarm Reporting:
 - a. Operator determines action to be taken for alarm event.
 - b. Alarms to be routed to appropriate workstation.
 - c. Reporting Options:
 - 1) Start programs.
 - 2) Print.
 - 3) Logged.
 - 4) Custom messaging.
 - 5) Graphical displays.
 - 6) Dial out to workstation receivers via system protocol.
- F. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.
- G. PID Control Characteristics:
 - 1. Direct or reverse action.
 - 2. Anti-windup.
 - 3. Calculated, time-varying, analog value, positions an output or stages a series of outputs.
 - 4. User selectable controlled variable, set-point, and PED gains.
- H. Staggered Start Application:
 - 1. Prevents all controlled equipment from simultaneously restarting after power outage.
 - 2. Order of equipment startup is user selectable.
- I. Energy Calculations:
 - 1. Accumulated instantaneous power or flow rates are converted to energy use data.
 - 2. Algorithm calculates a rolling average and allows window of time to be user specified in minute intervals.
 - 3. Algorithm calculates a fixed window average with a digital input signal from a utility meter defining the start of the window period that in turn synchronizes the fixed-window average with that used by the power company.
- J. Anti-Short Cycling:
 - 1. All binary output objects protected from short-cycling.
 - 2. Allows minimum on-time and off-time to be selected.
- K. On-Off Control with Differential:
 - 1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
 - 2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.
- L. Run-Time Totalization:
 - 1. Totalize run-times for all binary input objects.
 - 2. Provides operator with capability to assign high run-time alarm.

1.16 HVAC CONTROL PROGRAMS

- A. General:
 - 1. Support Inch-pounds units of measurement.
 - 2. Identify each HVAC Control system.
- B. Optimal Run Time:

1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
 2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
 3. Operator commands:
 - a. Define term schedule.
 - b. Add/delete fan status point.
 - c. Add/delete outside air temperature point.
 - d. Add/delete mass temperature point.
 - e. Define heating/cooling parameters.
 - f. Request optimal run time control summary.
 - g. Request HVAC point summary.
 - h. Request HVAC saving profile summary.
 4. Control Summary:
 - a. HVAC Control system begin/end status.
 - b. Optimal run time lock/unlock control status.
 - c. Heating/cooling mode status.
 - d. Optimal run time schedule.
 - e. Start/Stop times.
 - f. Optimal run time system normal start times.
 - g. Occupancy and vacancy times.
 - h. Optimal run time system heating/cooling mode parameters.
 5. HVAC point summary:
 - a. Control system identifier and status.
 - b. Point ID and status.
 - c. Outside air temperature point ID and status.
 - d. Calculated optimal start and stop times.
 - e. Period start.
- C. Supply Air Reset:
1. Adjust discharge temperatures to most energy efficient levels satisfying measured load by:
 - a. Raising cooling temperatures to highest possible value.
 - b. Reducing heating temperatures to lowest possible level.
 2. Operator commands:
 - a. Add/delete fan status point.
 - b. Lock/unlock program.
 - c. Request HVAC point summary.
 - d. Add/Delete discharge controller point.
 - e. Define discharge controller parameters.
 - f. Add/delete air flow rate.
 - g. Define space load and load parameters.
 - h. Request space load summary.
 3. Control summary:
 - a. HVAC control system status (begin/end).
 - b. Supply air reset system status.
 - c. Optimal run time system status.
 - d. Heating and cooling loop.
 - e. High/low limits.
 - f. Deadband.
 - g. Response timer.
 - h. Reset times.
 4. Space load summary:
 - a. HVAC system status.
 - b. Optimal run time status.
 - c. Heating/cooling loop status.

- d. Space load point ID.
 - e. Current space load point value.
 - f. Control heat/cool limited.
 - g. Gain factor.
 - h. Calculated reset values.
 - i. Fan status point ID and status.
 - j. Control discharge temperature point ID and status.
 - k. Space load point ID and status.
 - l. Air flow rate point ID and status.
- D. Enthalpy Switchover:
- 1. Calculate outside and return air enthalpy using measured temperature and relative humidity; determine energy expended and control outside and return air dampers.
 - 2. Operator commands:
 - a. Add/delete fan status point.
 - b. Add/delete outside air temperature point.
 - c. Add/delete discharge controller point.
 - d. Define discharge controller parameters.
 - e. Add/delete return air temperature point.
 - f. Add/delete outside air dew point/humidity point.
 - g. Add/delete return air dew point/humidity point.
 - h. Add/delete damper switch.
 - i. Add/delete minimum outside air.
 - j. Add/delete atmospheric pressure.
 - k. Add/delete heating override switch.
 - l. Add/delete evaporative cooling switch.
 - m. Add/delete air flow rate.
 - n. Define enthalpy deadband.
 - o. Lock/unlock program.
 - p. Request control summary.
 - q. Request HVAC point summary.
 - 3. Control summary:
 - a. HVAC control system begin/end status.
 - b. Enthalpy switchover optimal system status.
 - c. Optimal return time system status.
 - d. Current outside air enthalpy.
 - e. Calculated mixed air enthalpy.
 - f. Calculated cooling coil enthalpy using outside air.
 - g. Calculated cooling coil enthalpy using mixed air.
 - h. Calculated enthalpy difference.
 - i. Enthalpy switchover deadband.
 - j. Status of damper mode switch.

PART 3 EXECUTION

2.01 INSTALLERS

- A. Installer List:
- 1. Siemens Talon.

2.02 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that conditioned power supply is available to the control units and to the operator work station.
Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

2.03 INSTALLATION

- A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.
- B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 230993.
- C. Provide with 120v AC, 15 amp dedicated emergency power circuit to each programmable control unit.
- D. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

2.04 MANUFACTURER'S FIELD SERVICES

- A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.
- B. Provide service engineer to instruct Owner's representative in operation of systems plant and equipment for 4 day period.
- C. Provide basic operator training for 4 persons on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 40 hours dedicated instructor time. Provide training on site.

2.05 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate complete and operating system to Owner.

2.06 MAINTENANCE

- A. Provide service and maintenance of energy management and control systems for one years from Date of Substantial Completion.
- B. Provide four complete inspections per year, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.
- C. Provide complete service of systems, including call backs. Make minimum of 4 complete normal inspections of approximately 4 hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

SECTION 230993
SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.
- B. Sequence of operation for:
 - 1. Air terminal units.
 - 2. Central refrigeration systems.
 - 3. Central fan systems.
 - 4. Fan coil units.
 - 5. Heating coils.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
 - 1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
 - 2. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in Contract Documents.
 - 3. Include at least the following sequences:
 - a. Start-up.
 - b. Warm-up mode.
 - c. Normal operating mode.
 - d. Unoccupied mode.
 - e. Shutdown.
 - f. Capacity control sequences and equipment staging.
 - g. Temperature and pressure control, such as setbacks, setups, resets, etc.
 - h. Detailed sequences for all control strategies, such as optimum start/stop, staging, optimization, demand limiting, etc.
 - i. Effects of power or equipment failure with all standby component functions.
 - j. Sequences for all alarms and emergency shut downs.
 - k. Seasonal operational differences and recommendations.
 - l. Interactions and interlocks with other systems.
 - 4. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
 - 5. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.
 - 6. Include schedules, if known.
- C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
 - 1. Label with settings, adjustable range of control and limits.
 - 2. Include flow diagrams for each control system, graphically depicting control logic.
 - 3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
 - 4. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
 - 5. Include all monitoring, control and virtual points specified in elsewhere.

6. Include a key to all abbreviations.
- D. Points List: Submit list of all control points indicating at least the following for each point.
 1. Name of controlled system.
 2. Point abbreviation.
 3. Point description; such as dry bulb temperature, airflow, etc.
 4. Display unit.
 5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
 6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
 7. Intermediate point (Yes / No); i.e. a point whose value is used to make a calculation which then controls equipment, such as space temperatures that are averaged to a virtual point to control reset.
 8. Calculated point (Yes / No); i.e. a "virtual" point generated from calculations of other point values.
- E. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SEE DRAWINGS.

3.02 CENTRAL REFRIGERATION SYSTEMS

3.03 CENTRAL FAN SYSTEMS

3.04 FAN COIL UNITS

3.05 HEATING COILS

END OF SECTION

SECTION 232300
REFRIGERANT PIPING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Filter-driers.

1.02 REFERENCE STANDARDS

- A. AHRI 750 - Thermostatic Refrigerant Expansion Valves; 2007.
- B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2025).
- C. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.
- D. ASME B31.9 - Building Services Piping; 2025.
- E. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.
- F. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- G. UL 429 - Electrically Operated Valves; Current Edition, Including All Revisions.

1.03 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- C. Liquid Indicators:
 - 1. Use line size liquid indicators in main liquid line leaving condenser.
 - 2. Use line size on leaving side of liquid solenoid valves.
- D. Strainers:
 - 1. Use line size strainer upstream of each automatic valve.
- E. Filter-Driers:
 - 1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
 - 2. Use replaceable core filter-driers in lines of 1/2 inch (13 mm) outside diameter or greater.
 - 3. Use filter-driers for each solenoid valve.
- F. Solenoid Valves:
 - 1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.
- C. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store piping and specialties in shipping containers with labeling in place.
- B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS**2.01 REGULATORY REQUIREMENTS**

- A. Comply with ASME B31.9 for installation of piping system.
- B. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.
- C. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
 - 1. Fittings: ASME B16.22 wrought copper.
 - 2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.
- D. Copper Tube to 7/8 inch (22 mm) OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
- E. Pipe Supports and Anchors:
 - 1. Provide hangers and supports that comply with MSS SP-58.
 - a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Malleable iron adjustable swivel, split ring.
 - 3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 4. Wall Support for Pipe Sizes to 3 Inches (75 mm): Cast iron hook.
 - 5. Vertical Support: Steel riser clamp.
 - 6. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
 - 8. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
 - 9. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.02 MOISTURE AND LIQUID INDICATORS

- A. Manufacturers:
 - 1. Henry Technologies: www.henrytech.com/#sle.
 - 2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
 - 3. Sporlan, a Division of Parker Hannifin: www.parker.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa).

2.03 VALVES

- A. Manufacturers:
 - 1. Hansen Technologies Corporation: www.hantech.com/#sle.
 - 2. Henry Technologies: www.henrytech.com/#sle.
 - 3. Flomatic Valves: www.flomatic.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Diaphragm Packless Valves:

1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 275 degrees F (135 degrees C).
- C. Packed Angle Valves:
 1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 275 degrees F (135 degrees C).
- D. Ball Valves:
 1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 300 degrees F (149 degrees C).
- E. Service Valves:
 1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi (3450 kPa).

2.04 STRAINERS

- A. Manufacturers:
 1. Hansen Technologies Corporation: www.hantech.com/#sle.
 2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
 3. Sporlan, a Division of Parker Hannifin: www.parker.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. Straight Line or Angle Line Type:

2.05 CHECK VALVES

- A. Manufacturers:
 1. Hansen Technologies Corporation: www.hantech.com/#sle.
 2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
 3. Sporlan, a Division of Parker Hannifin: www.parker.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. Globe Type:
 1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F (149 degrees C) and maximum working pressure of 425 psi (2930 kPa).
- C. Straight Through Type:
 1. Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 200 degrees F (93 degrees C).

2.06 FILTER-DRIERS

- A. Manufacturers:
 1. Flow Controls Division of Emerson Electric: www.emersonflowcontrols.com/#sle.
 2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
 3. Sporlan, a Division of Parker Hannifin: www.parker.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.
 5. Replaceable Core Type: Steel shell with removable cap.
 6. Sealed Type: Copper shell.

2.07 SOLENOID VALVES

- A. Manufacturers:
 1. Flow Controls Division of Emerson Electric: www.emersonflowcontrols.com/#sle.
 2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
 3. Sporlan, a Division of Parker Hannifin: www.parker.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.

- B. Valve: AHRI 760 I-P, pilot operated, copper, brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, solder, or threaded ends; for maximum working pressure of 500 psi (3450 kPa).
- C. Coil Assembly: UL 429 UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

2.08 EXPANSION VALVES

- A. Manufacturers:
 - 1. Flow Controls Division of Emerson Electric: www.emersonflowcontrols.com/#sle.
 - 2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
 - 3. Sporlan, a Division of Parker Hannifin: www.parker.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Angle or Straight Through Type: AHRI 750; design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with non-replaceable capillary tube and remote sensing bulb and remote bulb well.
- C. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F (6 degrees C) superheat. Select to avoid being undersized at full load and excessively oversized at part load.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
- G. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.5.
 - 2. Support horizontal piping as indicated.
 - 3. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 6. Provide copper plated hangers and supports for copper piping.
- H. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

- I. Provide clearance for installation of insulation and access to valves and fittings.
- J. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 083100.
- K. Flood piping system with nitrogen when brazing.
- L. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.
- M. Insulate piping and equipment; refer to Section and Section 230716.
- N. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.
- O. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.
- P. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.
- Q. Fully charge completed system with refrigerant after testing.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Test refrigeration system in accordance with ASME B31.5.
- C. Pressure test system with dry nitrogen to 200 psi (1380 kPa). Perform final tests at 27 inches (92 kPa) vacuum and 200 psi (1380 kPa) using halide torch. Test to no leakage.

3.04 SCHEDULES

- A. Hanger Spacing for Copper Tubing.
 - 1. 1/2 inch (13 mm), 5/8 inch (16 mm), and 7/8 inch (22 mm) OD: Maximum span, 5 feet (1500 mm); minimum rod size, 1/4 inch (6.3 mm).
 - 2. 1-1/8 inch (29 mm) OD: Maximum span, 6 feet (1800 mm); minimum rod size, 1/4 inch (6.3 mm).
 - 3. 1-3/8 inch (35 mm) OD: Maximum span, 7 feet (2100 mm); minimum rod size, 3/8 inch (9.5 mm).
 - 4. 1-5/8 inch (41 mm) OD: Maximum span, 8 feet (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
 - 5. 2-1/8 inch (54 mm) OD: Maximum span, 8 feet (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
 - 6. 2-5/8 inch (67 mm) OD: Maximum span, 9 feet (2700 mm); minimum rod size, 3/8 inch (9.5 mm).

END OF SECTION

SECTION 233100
HVAC DUCTS AND CASINGS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Metal ductwork.
- B. Nonmetal ductwork.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2025b.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2024.
- E. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- I. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- J. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- K. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.
- L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).
- M. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for duct materials and duct liner.
- C. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for all duct systems.
- D. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of documented experience.

1.05 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS**2.01 DUCT ASSEMBLIES**

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.
- B. Ducts: Galvanized steel (bright or paint grip as indicated), unless otherwise indicated.
- C. Low Pressure Supply (System with Cooling Coils): 2 inch w.g. (500 Pa) pressure class, galvanized steel.
- D. Medium and High Pressure Supply: 6 inch w.g. (___ Pa) pressure class, galvanized steel.
- E. Return and Relief: 2 inch w.g. (___ Pa) pressure class, galvanized steel.
- F. General Exhaust: 2 inch w.g. (___ Pa) pressure class, galvanized steel.
- G. Dryer Exhaust: 2 inch w.g. (500 Pa) pressure class, aluminum.
 - 1. Construct of 16 gage, 0.0598 inch (1.52 mm) sheet steel using continuous external welded joints in rectangular sections.
- H. Fume Hood Exhaust: 2 inch w.g. (500 Pa) pressure class, CPVC.
- I. Outside Air Intake: 2 inch w.g. (___ Pa) pressure class, galvanized steel.

2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.
- C. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
 - 3. For Use With Flexible Ducts: UL labeled.
 - 4. Manufacturers:
 - a. Carlisle HVAC Products; Hardcast Iron-Grip 601 Water Based Duct Sealant: www.carlislehvac.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- E. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
 - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 - 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 - 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
 - 6. Other Types: As required.
 - 7. Manufacturers:
 - a. Powers Fasteners, Inc: www.powers.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.03 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE (FUND) Handbook - Fundamentals.
- C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

- E. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
- F. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- G. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

2.04 MANUFACTURED DUCTWORK AND FITTINGS

- A. Flat Oval Ducts: Machine made from round spiral lockseam duct.
 - 1. Manufacture in accordance with SMACNA (DCS).
 - 2. Fittings: Manufacture at least two gages heavier metal than duct.
 - 3. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Double Wall Insulated Flat Oval Ducts: Machine made from round spiral lockseam duct.
 - 1. Manufacture in accordance with SMACNA (DCS).
 - 2. Fittings: Manufacture with solid inner wall.
 - 3. Inner wall: Perforated galvanized steel.
- C. Double Wall Insulated Round Ducts: Round spiral lockseam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with perforated inner wall.
 - 1. Manufacture in accordance with SMACNA (DCS).
 - 2. Insulation:
 - a. Thickness: 1 inch (25 mm).
 - b. Material: Fiberglass.
- D. Spiral Ducts: Round spiral lockseam duct with galvanized steel outer wall.
 - 1. Manufacture in accordance with SMACNA (DCS).
- E. Round Ducts: Round lockseam duct with galvanized steel outer wall.
 - 1. Manufacture in accordance with SMACNA (DCS).
- F. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
 - 1. Insulation: Fiberglass insulation with aluminized vapor barrier film.
 - 2. Pressure Rating: 2 inches WG (___ kPa) positive and 2 inches WG (___ Pa) negative.
 - 3. Maximum Velocity: 4000 fpm (20.3 m/sec).
 - 4. Temperature Range: Minus 10 degrees F to 160 degrees F (Minus 23 degrees C to 71 degrees C).
 - 5. Manufacturers:
 - a. Hart & Cooley, Inc: www.hartandcooley.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Flexible Ducts: Connect to metal ducts with adhesive, draw bands, and tape.
- E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with crimp in direction of air flow.
- I. Use double nuts and lock washers on threaded rod supports.

- J. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.
- K. Connect diffusers to low pressure ducts directly or with 6 feet maximum length of flexible duct held in place with strap or clamp.
- L. At exterior wall louvers, seal duct to louver frame.

3.02 CLEANING

END OF SECTION

SECTION 233300
AIR DUCT ACCESSORIES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Air turning devices/extractors.
- B. Combination fire and smoke dampers.
- C. Duct access doors.
- D. Duct test holes.
- E. Fire dampers.
- F. Flexible duct connections.
- G. Volume control dampers.
- H. Miscellaneous products:
 - 1. Internal strut end plugs.
 - 2. Duct opening closure film.

1.02 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- B. NFPA 92 - Standard for Smoke Control Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.
- D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).
- E. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- F. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
- G. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors, and duct test holes.
- D. Manufacturer's Installation Instructions: Provide instructions for fire dampers and combination fire and smoke dampers.
- E. Project Record Drawings: Record actual locations of access doors and test holes.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS**2.01 AIR TURNING DEVICES/EXTRACTORS**

- A. Manufacturers:

1. Carlisle HVAC Products: www.carlislehvac.com/#sle.
 2. Elgen Manufacturing: www.elgenmfg.com.
 3. Krueger: www.krueger-hvac.com.
 4. Ruskin Company: www.ruskin.com.
 5. Titus: www.titus-hvac.com.
 6. Ward Industries by Commercial Products Group of Hart & Cooley, Inc: www.wardind.com.
 7. Substitutions: See Section 016000 - Product Requirements.
- B. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.02 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers:
1. Louvers & Dampers, Inc: www.louvers-dampers.com.
 2. Nailor Industries Inc: www.nailor.com.
 3. Ruskin Company: www.ruskin.com.
 4. Greenheck.
 5. Substitutions: See Section 016000 - Product Requirements.
- B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.
- C. Provide factory sleeve and collar for each damper.
- D. Multiple Blade Dampers: Fabricate with 16 gage, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.
- E. Operators: UL listed and labelled spring return electric type suitable for 24 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on exterior of duct and link to damper operating shaft.
- F. Electro Thermal Link: Fusible link melting at 212 degrees F (____ degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.03 DUCT ACCESS DOORS

- A. Manufacturers:
1. Acudor Products Inc: www.acudor.com.
 2. Elgen Manufacturing: www.elgenmfg.com.
 3. Nailor Industries Inc: www.nailor.com.
 4. Ruskin Company: www.ruskin.com.
 5. SEMCO Incorporated: www.semcohvac.com.
 6. Ward Industries by Commercial Products Group of Hart & Cooley, Inc: www.wardind.com.
 7. Substitutions: See Section 016000 - Product Requirements.
- B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch (25 mm) thick insulation with sheet metal cover.
1. Less Than 12 inches (300 mm) Square: Secure with sash locks.
 2. Up to 18 inches (450 mm) Square: Provide two hinges and two sash locks.
 3. Up to 24 by 48 inches (600 by 1200 mm): Three hinges and two compression latches with outside and inside handles.
 4. Larger Sizes: Provide an additional hinge.
- C. Access doors with sheet metal screw fasteners are not acceptable.

2.04 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.
1. Manufacturers:

2. Carlisle HVAC Products: www.carlislehvac.com/#sle.

2.05 FIRE DAMPERS

- A. Manufacturers:
 1. Louvers & Dampers, Inc: www.louvers-dampers.com.
 2. Nailor Industries Inc: www.nailor.com.
 3. Ruskin Company: www.ruskin.com.
 4. Ward Industries, a brand of Hart and Cooley, Inc; _____: www.wardind.com/#sle.
 5. Greenheck.
 6. Substitutions: See Section 016000 - Product Requirements.
- B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C. Horizontal Dampers: Galvanized steel, 22 gage, 0.0299 inch (0.76 mm) frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- D. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations or closure under air flow conditions. Configure with blades out of air stream except for 1 inch (_____ Pa) pressure class ducts up to 12 inches (300 mm) in height.
- E. Multiple Blade Dampers: 16 gage, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- F. Fusible Links: UL 33, separate at 212 degrees F (100 degrees C) with adjustable link straps for combination fire/balancing dampers.

2.06 FLEXIBLE DUCT CONNECTIONS

- A. Manufacturers:
 1. Carlisle HVAC Products: www.carlislehvac.com/#sle.
 2. Elgen Manufacturing: www.elgenmfg.com/#sle.
 3. Substitutions: See Section 016000 - Product Requirements.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip.
 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd (1.0 kg/sq m).
 - a. Net Fabric Width: Approximately 3 inches (75 mm) wide.
 2. Metal: 3 inches (75 mm) wide, 24 gage, 0.0239 inch (0.61 mm) thick galvanized steel.
- D. Leaded Vinyl Sheet: Minimum 0.55 inch (14 mm) thick, 0.87 lbs per sq ft (4.2 kg/sq m), 10 dB attenuation in 10 to 10,000 Hz range.
- E. Maximum Installed Length: 14 inch (356 mm).

2.07 VOLUME CONTROL DAMPERS

- A. Manufacturers:
 1. Louvers & Dampers, Inc: www.louvers-dampers.com/#sle.
 2. Nailor Industries Inc: www.nailor.com/#sle.
 3. Ruskin Company: www.ruskin.com/#sle.
 4. Greenheck.
 5. Substitutions: See Section 016000 - Product Requirements.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch (200 by 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
 1. Blade: 18 gage, 0.0478 inch (1.21 mm), minimum.
- D. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

1. Manufacturers:
 - a. Carlisle HVAC Products: www.carlislehvac.com/#sle.
 - b. Elgen Manufacturing Company, Inc; Snap-in Bushing: www.elgenmfg.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
- E. Quadrants:
 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 3. Where rod lengths exceed 30 inches (750 mm) provide regulator at both ends.
 4. Manufacturers:
 - a. Carlisle HVAC Products: www.carlislehvac.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.08 MISCELLANEOUS PRODUCTS

- A. Internal Strut End Plugs: Combination end-mounting and sealing plugs for metal conduit used as internal reinforcement struts for metal ducts; plug crimped inside conduit with outside gasketed washer seal.
 1. Manufacturers:
 - a. Carlisle HVAC Products: www.carlislehvac.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- B. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
 1. Thickness: 2 mils (0.6 mm).
 2. High tack water based adhesive.
 3. UV stable light blue color.
 4. Elongation Before Break: 325 percent, minimum.
 5. Manufacturers:
 - a. Carlisle HVAC Products: www.carlislehvac.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 233100 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 by 8 inch (200 by 200 mm) size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch (100 by 100 mm) for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers and combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.
- G. Demonstrate re-setting of fire dampers to Owner's representative.
- H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

- J. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 3 duct widths from duct take-off.
- K. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 233423
HVAC POWER VENTILATORS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Roof exhausters.
- B. Inline centrifugal fans.
- C. Kitchen hood upblast roof exhausters.

1.02 REFERENCE STANDARDS

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- B. AMCA 99 - Standards Handbook; 2016.
- C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.
- E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- F. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.
- G. UL 705 - Power Ventilators; Current Edition, Including All Revisions.
- H. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate installation instructions.
- D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 FIELD CONDITIONS

- A. Permanent ventilators may not be used for ventilation during construction.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Greenheck: www.greenheck.com.
- B. Loren Cook Company: www.lorencook.com.
- C. PennBarry: www.pennbarry.com.

2.02 POWER VENTILATORS - GENERAL

- A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.
- B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- C. Fabrication: Comply with AMCA 99.

- D. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- F. Enclosed Safety Switches: Comply with NEMA EN 10250.

2.03 ROOF EXHAUSTERS

- A. Roof Curb: 12 inch (300 mm) high self-flashing of galvanized steel with continuously welded seams, built-in cant strips.
- B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor .
- C. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.
- D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.04 INLINE CENTRIFUGAL FANS

- A. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.
- B. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted switch.
- C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.05 KITCHEN HOOD UPBLAST ROOF EXHAUSTERS

- A. Manufacturers:
 - 1. Greenheck Fan Corporation; _____: www.greenheck.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Direct Drive Fan:
 - 1. Fan Wheel:
 - a. Type: Non-overloading, backward inclined centrifugal.
 - b. Material: Aluminum.
 - 2. Statically and dynamically balanced.
 - 3. Motors:
 - a. Open drip-proof (ODP).
 - b. Heavy duty ball bearing type.
 - c. Mount on vibration isolators or resilient cradle mounts, out of air stream.
 - d. Fully accessible for maintenance.
 - 4. Housing:
 - a. Construct of heavy gage aluminum including curb cap, windband, and motor compartment.
 - b. Rigid internal support structure.
 - c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
 - d. Construct drive frame assembly of heavy gage steel, mounted on vibration isolators.
 - e. Provide breather tube for fresh air motor cooling and wiring.
- C. Shafts and Bearings:
 - 1. Fan Shaft:
 - a. Ground and polished steel with anti-corrosive coating.
 - b. First critical speed at least 25 percent over maximum cataloged operating speed.
 - 2. Bearings:
 - a. Permanently sealed or pillow block type.
 - b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
 - c. 100 percent factory tested.

- D. Drive Assembly:
 - 1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
 - 2. Belts: Static free and oil resistant.
 - 3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
 - 4. Motor pulley adjustable for final system balancing.
 - 5. Readily accessible for maintenance.
- E. Disconnect Switches:
 - 1. Factory mounted and wired.
 - 2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Outdoor Locations: Type 3R.
 - 3. Finish for Painted Steel Enclosures: Provide manufacturer's standard, factory applied gray, or _____ unless otherwise indicated.
 - 4. Positive electrical shutoff.
 - 5. Wired from fan motor to junction box installed within motor compartment.
- F. Roof Curb: 24 inch (600 mm) high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, and ventilated double wall.
- G. Drain Trough: Allows for single-point drainage of water, grease, and other residues.
- H. Options/Accessories:
 - 1. Clean Out Port: Removable grease repellent compression rubber plug allows access for cleaning wheel through windband.
 - 2. Roof Curb Extension: Vented curb extension where required for compliance with minimum clearances required by NFPA 96.
 - 3. Drain Connection:
 - a. Aluminum construction.
 - b. Allows single-point drainage of grease, water, or other residues.
 - 4. Finishes: Factory primed.
 - 5. Grease Trap:
 - a. Aluminum.
 - b. Includes drain connection.
 - c. Collects grease residue.
 - 6. Hinge Kit:
 - a. Aluminum hinges.
 - b. Hinges and restraint cables mounted to base (sleeve).
 - c. Allows fan to tilt away for access to wheel and ductwork for inspection and cleaning.
 - 7. Heat Baffle: Prevents heat from radiating into motor compartment.
 - 8. Tie-down Points: Four brackets located on windband secures fan in heavy wind applications.
 - 9. External motor speed controllers for field mounting.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.
- C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.
- D. Install backdraft dampers on inlet to roof and wall exhausters.

END OF SECTION

SECTION 233600
AIR TERMINAL UNITS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Single-duct terminal units.
 - 1. Single-duct, variable-volume units.

1.02 REFERENCE STANDARDS

- A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).
- B. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017 (Reaffirmed 2023).
- C. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2025.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air flow, static pressure, and NC designation. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
- D. Manufacturer's Installation Instructions: Indicate support and hanging details, installation instructions, recommendations, and service clearances required.
- E. Project Record Documents: Record actual locations of units and controls components and locations of access doors required for access of valving.
- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant-volume regulators.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for air terminal units.

PART 2 PRODUCTS**2.01 SINGLE-DUCT, VARIABLE-VOLUME UNITS**

- A. Manufacturers:
 - 1. Metalaire, a brand of Metal Industries Inc: www.metalaire.com/#sle.
 - 2. Price Industries, Inc.: www.priceindustries.com/#sle.
 - 3. Seimens.
 - 4. Environmental Technologies
 - 5. Substitutions: See Section 016000 - Product Requirements.

- B. Basis of Design: Price Industries, Inc.
 - 1. Single-Duct Terminal Unit: SDV, (direct digital controls).
- C. General:
 - 1. Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
 - 2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.
- D. Unit Casing:
 - 1. Minimum 22 gage, 0.0299 inch (0.76 mm) galvanized steel.
 - 2. Air Inlet Collar: Provide round, suitable for standard duct sizes.
 - 3. Unit Discharge: Rectangular, with slip-and-drive connections.
 - 4. Acceptable Liners:
 - a. 1 inch (25 mm) thick, coated, fibrous-glass complying with ASTM C1071.
 - 1) Secure with adhesive.
 - 2) Coat edges exposed to airstream with NFPA 90A approved sealant.
 - 3) Cover liner with _____.
 - b. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.
- E. Damper Assembly:
 - 1. Heavy-gage, galvanized steel or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
 - 2. Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
 - 3. Incorporate low leak damper blades for tight airflow shutoff.
 - a. Air Leakage Past Closed Damper: Maximum two percent of unit maximum airflow at 3 inch wg (750 Pa) inlet static pressure, tested in accordance with ASHRAE Std 130.
- F. Hot Water Heating Coil:
 - 1. Coil Casing: Minimum 22 gage, 0.0299 inch (0.76 mm) galvanized steel, factory-installed on terminal discharge with rectangular outlet, duct connection type.
 - 2. Coil Fins: Aluminum or aluminum plated fins, mechanically-bonded to seamless copper tubes.
 - 3. Coil leak tested to minimum 300 psig (2068 kPa).
 - 4. Base performance data on tests run in accordance with AHRI 410 and units to bear AHRI 410 label.
- G. Control Transformers: Factory supplied and mounted for electric and electronic control applications.
- H. Controls:
 - a. Basis of Design: Seimens
 - b. Include a field-installed, factory-tested, direct-digital controller.
 - c. Microprocessor-Based Controller: Air volume controller, pressure-independent with electronic airflow transducers, factory-calibrated maximum and minimum CFM's.
 - 1) Time-proportional reheat coil control.
 - d. Room Sensor:
 - 1) Compatible with temperature controls specified.
 - 2) Wall-mounted, system powered, with temperature set-point adjustment including connection access for portable operator terminal.
 - 2. Airflow Sensor: Differential pressure airflow device measuring total, static, and wake pressures.
 - a. Signal accuracy: Plus/minus five percent throughout terminal operating range.
 - 3. Control Sequence:
 - a. Suitable for operation with duct pressures between 0.25 and 3.0 inch wg (60 and 750 Pa) inlet static pressure.
 - b. Include factory-mounted and piped, 5-micron filter; and adjustable, velocity-resetting, high-limit control with amplifying relay.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are suitable for installation.
- B. Verify that field measurements are as indicated on drawings.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.
- C. See drawings for the size(s) and duct location(s) of the air terminal units.
- D. Provide ceiling access doors or locate units above easily removable ceiling components.
- E. Support units individually from structure with wire rope complying with ASTM A492 and ASTM A603 in accordance with SMACNA (SRM). See Section 23 0548.
- F. Embed anchors in concrete in accordance with ASTM E488/E488M.
- G. Do not support from ductwork.
- H. Connect to ductwork in accordance with Section 233100.
- I. Provide minimum of 10 ft (___ m) of 1 inch (25 mm) thick lined ductwork downstream of units.
- J. Install heating coils in accordance with Section 238200.
- K. Verify that electric power is available and of the correct characteristics.

3.03 ADJUSTING

- A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to zero percent full flow.

END OF SECTION

SECTION 233700
AIR OUTLETS AND INLETS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Diffusers.
- B. Registers/grilles.
- C. Door grilles.

1.02 REFERENCE STANDARDS

- A. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.
- B. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- C. Project Record Documents: Record actual locations of air outlets and inlets.

1.04 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Price Industries: www.price-hvac.com/#sle.
- B. Titus: www.titus-hvac.com.
- C. Metalaire.
- D. Substitutions: See Section 016000 - Product Requirements.

2.02 ROUND CEILING DIFFUSERS

- A. Type: Round, adjustable pattern, stamped or spun, multi-core diffuser to discharge air in 360 degree pattern, with sectorizing baffles where indicated. Diffuser collar shall project not more than 1 inch (25 mm) above ceiling.
- B. Fabrication: Steel with baked enamel finish.
- C. Color: As indicated.
- D. Accessories: Radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.03 RECTANGULAR CEILING DIFFUSERS

- A. Type: Provide plaque type diffuser to discharge air in 360 degree pattern.
- B. Connections: Round.
- C. Frame: Provide surface mount and inverted T-bar type.
- D. Fabrication: Steel with baked enamel finish.
- E. Color: As indicated.
- F. Accessories: Provide radial opposed blade volume control damper; removable core and equalizing grid with damper adjustable from diffuser face.

2.04 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with blades set at 45 degrees, horizontal face, full louvered face.
- B. Frame: 1-1/4 inch (32 mm) margin with concealed mounting.
- C. Fabrication: Steel with 20 gage, 0.0359 inch (0.91 mm) minimum frames and 22 gage, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gage, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.
- D. Color: As indicated.

2.05 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

- A. Fabrication: Grid core consists of aluminum with mill aluminum finish.
- B. Color: As indicated on the drawings.
- C. Frame: 1-1/4 inch (32 mm) margin with concealed mounting.
- D. Frame: Channel lay-in frame for suspended grid ceilings.
- E. Accessories: Provide 45 degree angled eggcrate or other similar provisions for visual blocking such as angled louver, 90 degree duct elbow, etc..

2.06 WALL SUPPLY REGISTERS/GRILLES

- A. Type: Streamlined and individually adjustable blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing with spring or other device to set blades, horizontal face, double deflection.
- B. Frame: 1-1/4 inch (32 mm) margin with concealed mounting and gasket.
- C. Fabrication: Steel with 20 gage, 0.0359 inch (0.91 mm) minimum frames and 22 gage, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gage, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.
- D. Color: As indicated.
- E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.07 WALL EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with spring or other device to set blades, horizontal face.
- B. Frame: 1-1/4 inch (32 mm) margin with concealed mounting.
- C. Fabrication: Steel frames and blades, with factory baked enamel finish.
- D. Color: As indicated on the drawings.

2.08 DOOR GRILLES

- A. Type: V-shaped louvers of 20 gage, 0.0359 inch (0.91 mm) thick steel, 1 inch (25 mm) deep on 1/2 inch (13 mm) centers.
- B. Frame: 20 gage, 0.0359 inch (0.91 mm) steel with auxiliary frame to give finished appearance on both sides of door, with factory prime coat finish.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- D. Install diffusers to ductwork with air tight connection.
- E. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

- F. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 099123.

END OF SECTION

SECTION 234000
HVAC AIR CLEANING DEVICES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Disposable, extended area panel filters.
- B. Disposable panel filters.

1.02 REFERENCE STANDARDS

- A. AHRI 850 (I-P) - Performance Rating of Commercial and Industrial Air Filter Equipment; 2013 (Reaffirmed 2023).
- B. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2025.
- C. UL 900 - Standard for Air Filter Units; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Indicate assembly and change-out procedures.
- D. Operation and Maintenance Data: Include instructions for operation, changing, and periodic cleaning.

PART 2 PRODUCTS**2.01 FILTER MANUFACTURERS**

- A. American Filtration Inc: www.americanfiltration.com/#sle.
- B. AAF International/American Air Filter: www.aafintl.com/#sle.
- C. The Camfil Group: www.camfilfarr.com/#sle.
- D. Substitutions: See Section 016000 - Product Requirements.

2.02 DISPOSABLE, EXTENDED AREA PANEL FILTERS

- A. Media: UL 900 Class 1, pleated, fine, glass fiber; supported and bonded to welded wire grid .
 - 1. Frame: Cardboard.
- B. Minimum Efficiency Reporting Value (MERV): 8, when tested in accordance with ASHRAE Std 52.2.
- C. Rating, per ASHRAE Std 52.2:
 - 1. Initial resistance at 500 FPM (2.54 m/sec) face velocity: 0.20 inch WG (50 Pa).

2.03 DISPOSABLE PANEL FILTERS

- A. Media: UL 900 Class 2, fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive.
- B. Performance Rating:
 - 1. Face Velocity: 500 FPM (2.54 m/sec).
 - 2. Initial Resistance: 0.15 inch WG (37 Pa).
- C. Casing: Cardboard frame.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Install air cleaning devices in accordance with manufacturer's instructions.
- B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.
- C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

END OF SECTION

SECTION 237413
PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Packaged roof top unit.
- B. Unit controls.
- C. Roof mounting curb and base.
- D. Maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 230548 - Vibration and Seismic Controls for HVAC.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

1.04 QUALITY ASSURANCE**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Carrier Global Corporation; _____: www.carrier.com/#sle.
- B. Trane Technologies, PLC; _____: www.trane.com/#sle.
- C. York, a brand of Johnson Controls International, PLC; _____: www.york.com/#sle.
- D. AAON.
- E. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Gas Heating:
 - 1. Min e
- B. Cooling Capacity:

2.03 MANUFACTURED UNITS

- A. General: Roof mounted units having gas burner and electric refrigeration.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.
- C. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.

2.04 FABRICATION

- A. Cabinet: Steel with baked enamel finish, including access doors with piano hinges and locking handle. Structural members shall be minimum 18 gauge, 0.0478 inch (1.21 mm), with access doors or panels of minimum 20 gauge, 0.0359 inch (0.91 mm).
- B. Heat Exchangers: Aluminized steel, of welded construction.
- C. Supply Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch pulley, and rubber isolated hinge mounted high efficiency motor or direct drive; see Section 230548. Isolate complete fan assembly.

2.05 BURNER

- A. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot.

- B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after airflow proven and slight delay, allow gas valve to open.

2.06 EVAPORATOR COIL

- A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.
- B. Provide capillary tubes or thermostatic expansion valves for units of 6 Tons of refrigeration (21 kw) capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 Tons of refrigeration (26 kW) cooling capacity and larger.

2.07 COMPRESSOR

- A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

2.08 CONDENSER COIL

- A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.
- B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

2.09 HEAT RECOVERY COIL

- A. Provide copper tube aluminum fin coil assembly with multiple circuits arranged to provide heat recovery.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.02 SYSTEM STARTUP

- A. Prepare and start equipment. Adjust for proper operation.

3.03 CLOSEOUT ACTIVITIES

3.04 MAINTENANCE

- A. Provide service and maintenance of packaged roof top units for one year year from Date of Substantial Completion.
- B. Provide routine maintenance service with a two month interval as maximum time period between calls.
- C. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibration.
- D. After each service call, submit copy of service call work order or report that includes description of work performed.

END OF SECTION

SECTION 237433
DEDICATED OUTDOOR AIR UNITS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Outdoor-mounted DOAS.
- B. Roof-mounted DOAS.

1.02 RELATED REQUIREMENTS

- A. Section 230513 - Common Motor Requirements for HVAC Equipment.
- B. Section 230934 - Variable-Frequency Motor Controllers.
- C. Section 251400 - Integrated Automation Local Control Units.
- D. Section 251500 - Integrated Automation Software: BAS, BMS, or SCADA.

1.03 REFERENCE STANDARDS

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment; 2025.
- C. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- E. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL (DIR) - Online Certifications Directory; Current Edition.
- H. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE**1.06 WARRANTY**

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturers warranty for compressor/condenser unit.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. AAON.
- B. Substitutions: See Section 016000 - Product Requirements.

2.02 ROOF-MOUNTED DOAS

- A. Packaged Unit:
 - 1. Casing and Components:
 - a. Fabrication: AHRI 210/240 and UL 207 construction, ASHRAE Std 23 tested.
 - b. 18 gauge, 0.0478 inch (1.21 mm) steel panels reinforced with structural angles and channels to ensure rigidity.

- c. Provide bolted access panels to access each sections from either side of unit.
 - d. Provide hinged door with lockable handle for serviceable sections.
 - e. Drain Pan: Galvanized steel with corrosion-resistant coating.
 - 2. Performance Ratings: ASHRAE Std 90.1, EER and COP as applicable.
 - 3. Regulatory Requirements: AHRI 270 (SI/I-P) rated, NFPA 70, and UL (DIR) listed.
 - 4. Insulation: Minimum 1/2 inch (13 mm) thick acoustic duct liner for lining cabinet interior.
 - 5. External Surface Finish: Heat resistant baked enamel.
 - 6. Outdoor Installation: Weatherproofed casing, with intake louver or hood.
 - 7. Outside Air Damper with Rain Hood and Screen:
- B. Filter Section:
- 1. Filter: Removable, 4 inches (100 mm) thick MERV-13.
- C. Heating Section:
- 1. Indirect Gas-Fired Furnace:
 - a. Insulation: Neoprene faced glass fiber insulation, 1 inch (25 mm) thick, on inlet components to burner profile plate.
 - b. Observation Port: On burner section for observing main and pilot flames.
 - c. Pilot: Electrically ignited by spark rod through high voltage ignition transformer.
 - d. Damper: Motorized with end switch to prove position before burner will fire.
- D. Cooling Section:
- 1. Packaged DX Cooling:
 - a. Configuration: AHRI 520-rated, R-454B refrigerant system with hot gas bypass.
 - b. Evaporator Coil: Copper tube aluminum fin coil assembly with alternate row circuiting, and with galvanized drain pan and thermostatic expansion valve.
 - c. Compressor: Variable Capacity hermetic _____, 3,600 rpm maximum resilience with positive lubrication, crankcase heater, high pressure control, low pressure control, motor overload protection, service valves and dryer.
 - d. Condenser Side: Aluminum fin and copper tube coil, direct drive axial fan resiliently mounted, galvanized fan guard. ECM condenser fans.
 - e. Operating and Safety Controls: Internally coordinated with main unit controls.
- E. Enthalphy Economizer Section: Provide factory-installed sensors, electrically-actuated return air damper, and electrically-actuated exhaust damper fully coordinated with return, exhaust, or return-exhaust fan section. Configure controls for fault-detection diagnostics.
- F. Energy Recovery Section: Provide wheel recovery device fully coordinated with return, exhaust, or return-exhaust fan section.
- G. Fan Section:
- 1. Provide direct or plenum mounted variable-speed fan motors; see Section 230513.
 - 2. Draw-through, forward-curved fan, constructed of corrosion-resistant, galvanized material and designed for efficient, quiet operation.
 - 3. Factory program for both soft start and constant flow output over static pressure range.
 - 4. Provide preinstalled neutral wire protection when required to support specified fan type.
 - 5. Motor to include thermal overload protection, quick disconnect plug, and permanently lubricated bearings.
 - 6. Belt-Driven Motor Requirements: Provide adjustable blower motor/sheave combination device based on indicated flow performance requirements. Statically and dynamically balanced centrifugal fan mounted on solid steel shaft with heavy-duty, self-aligning, prelubricated ball bearings and V-belt drive with matching motor sheaves and belts.
 - 7. Variable Speed Control: Configure controller to maintain adjustable flow setpoint for modulating or speed-switched units; see Section 230934.
 - 8. Fan Turndown: Design control features to allow fan speed reduction to adjustable 50 percent of its capacity when the zone set point temperature is satisfied or when unit runs in fan-only mode.
- H. Unit Controls:
- 1. DDC:

- a. Application Specific Controller; see Section 251400 unless factory-provided.
- b. Tested to monitor and handle sequencing functions and other operational modes using field-mounted thermostat and other sensors.
- c. Coordination and Sequencing:
 - 1) Internal Devices: Include compressors, blower, sensors, switches, valves, safeties, other components.
 - 2) Field-Installed Devices: Solenoid valves, thermostat, EWT sensors, LWT sensors, internal and remote contacts, and other devices required for operation.
 - 3) Safeties: At minimum include anti-short-cycle compressor protection, condensate overflow, refrigerant high pressure, refrigerant low pressure, loss-of-charge, refrigerant freeze protection, and freezestat.
- 2. Thermostat:
 - a. Field mounted and wired, tied into prewired control-interface terminals.
 - b. Smart Thermostat:
 - 1) BAS, SCADA, or Integrated Automation linked programmable thermostat; see Section 251400.
- 3. Airflow Meter:
 - a. Include integral airflow meter station or probe for ventilation, supply, or exhaust airflow in cfm (L/min) as indicated on drawings.
- 4. Local Control Panel: Interface to include on-off-auto switch, summer-winter switch, heat-off-cool switch, indicating lights for supply fan, pilot operation, burner operation, lockout indication, and clogged filter indication.
- I. Electrical: 480 VAC, 3-phase, 60 Hz, single point to factory-mounted nonfused disconnect switch internally wired into motors and compressors, and other powered components including system safeties.
- J. Furnish dedicated outdoor air unit and associated components and accessories produced by a single manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Connect drain pan outlet to nearest building drain system piping.
- C. Adjusting: Use plenum static pressure readings against manufacturer calibration chart to adjust primary airflow as other measuring methods will not work.
- D. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface; see Section 251500.

END OF SECTION

SECTION 238126.13
SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Air-source heat pumps.
- B. Indoor ductless fan & coil units.
- C. Controls.

1.02 REFERENCE STANDARDS

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2025).
- D. ASHRAE Std 23.1 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Pressures of the Refrigerant; 2019.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- G. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
- D. Design Data: Indicate refrigerant pipe sizing.
- E. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- G. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- H. Project Record Documents: Record actual locations of components and connections.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturers warranty for heat exchangers, condensing units, and compressors.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Trane Inc; _____: www.trane.com/#sle.
- B. LG.
- C. Substitutions: See Section 016000 - Product Requirements.

2.02 SYSTEM DESIGN

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
 - 1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator; auxiliary electric heat.
 - 2. Cooling: Outdoor electric condensing unit with evaporator coil in central ducted indoor unit.
 - 3. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Drawings for additional requirements.

2.03 INDOOR UNITS FOR DUCTLESS SYSTEMS**2.04 OUTDOOR UNITS**

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Comply with AHRI 210/240.
 - 2. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
 - 3. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.
- B. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
 - 1. Condenser Fans: Direct-drive propeller type.
 - 2. Condenser Fan Motor: Enclosed, 1-phase type, permanently lubricated.
- C. Coil: Air-cooled, aluminum fins bonded to copper tubes.
- D. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
 - 1. Provide thermostatic expansion valves.
- E. Operating Controls:
 - 1. Control by room thermostat to maintain room temperature setting.
 - 2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig (1965 kPa) and off when pressure drops below 140 psig (965 kPa) for operation to 0 degrees F (-18 degrees C).

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.
- C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.
- C. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION

SECTION 260010
BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL**1.01 DESCRIPTION**

- A. This section is an extension of the General Requirements and certain items of a common or administrative nature that pertain to all electrical work.
- B. The work of this section consists of furnishing materials, equipment, constant competent supervision, special tools, test equipment, technicians, and labor necessary for installation of a complete working electrical system as indicated herein and on the Drawings.
- C. The work shall include but not necessarily be limited to the following:
 - 1. Temporary electrical service for construction.
 - 2. All Electrical Construction.
- D. Lighting System.
- E. Power System.
- F. Fire Alarm system
- G. Telecommunication System.
- H. Security Touchscreen Control Systems
- I. Intercommunication System
- J. Video Management System
- K. Access Control System
- L. Grounding system.

1.02 QUALITY ASSURANCE

- A. The electrical installation shall conform to the requirements of the latest edition of the National Electrical Code (NEC). Notify Architect/Engineer of conflicts before performance.
- B. Electrical material shall be built and tested in accordance with the applicable standards of the (NEMA), (ANSI), (ASTM), and (IEEE).
- C. Electrical materials shall be new and unused and shall be listed and labeled for the service intended by Underwriters' Laboratories, Inc., where such labeling service is available.

1.03 REGULATORY REQUIREMENTS

- A. Permits: Obtain and pay for all necessary permits, inspections, connection charges, fees, insurance, bond, licenses, and comply with all governing laws, ordinances, rules and regulations.

1.04 COORDINATION

- A. Contractor shall be responsible for coordination of all work with other disciplines.
- B. Arrange work in a neat, well organized manner with exposed conduit and similar services running parallel with primary lines of the building construction, high as possible with a minimum of 8'-0" overhead clearance or as directed by the Engineer.
- C. Where the method of installation is not certain, ask for details. Lack of details, not requested, will not be an excuse for improper installation, and any such work must be corrected at contractor's cost.
- D. Coordination Drawings: For locations where several elements of electrical or combined mechanical and electrical work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings showing the actual physical dimensions (at accurate scale, minimum 1/4") required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.
- E. All Bidders shall be responsible to insure that equipment selected, switchboards, panel boards, etc., fit in spaces selected, along with NEC compliance. If standard equipment does not fit, Contractor shall be required to utilize custom equipment as required.

1.05 DRAWINGS AND SPECIFICATIONS

- A. Contract Documents (Drawings and Specifications) are intended to convey the scope of work and indicate general arrangements of equipment, fixtures and piping, and approximate sizes and locations of equipment and outlets. Follow these documents in laying out the work, check all Drawings to become familiar with all conditions affecting the work, and verify spaces in which the work will be installed.
- B. The contractor shall fully coordinate installation of electrical system with other disciplines. The Drawings show approximate locations only of selected feeders, branch circuits, outlets, etc., except where specific routing or dimensions are indicated. The Engineer reserves the right to make reasonable changes in locations indicated before roughing-in without additional cost to the Owner.
 - 1. Contractor shall investigate the structural and finish conditions affecting Division 26 work and shall arrange such work accordingly, furnishing fittings, bends, junction boxes, pull boxes, access panels, and accessories required to meet such conditions.
 - 2. These Specifications, together with the accompanying Drawings, contemplate apparatus fully erected, and in satisfactory operating condition with the Contractor furnishing and installing everything that may be necessary to complete the job.
 - 3. Contractor shall install circuits, breakers, equipment, etc. as indicated and label the above as noted. Contractor shall not deviate from equipment/circuit identification unless approved by Owner/Engineer.

1.06 SUBMITTALS

- A. Shop Drawings:
 - 1. Listed below are shop drawings required for transmittal. Refer to Phasing Plan for scheduling of submittal. No time delays will be allowed for failure to be so informed.
 - a. Lighting Fixtures (Interior and Exterior under the same submittal)
 - b. Lighting Controls (Submit under the Lighting Submittal)
 - c. Raceways
 - d. Connectors
 - e. Safety Switches
 - f. Fuses
 - g. Circuit Breakers
 - h. Wiring Devices
 - i. Motor Controls
 - j. Panel boards
 - k. Conductors
 - l. Fire Alarm System
 - m. Telecommunication System Components
 - n. Intercom System Components
 - o. Security Camera System Components
 - p. Access Control System Components
 - q. Relays and Contactors
 - 2. Transformers
 - 3. Grounding products
 - 4. Further descriptions or information required with shop drawings shall be included with the description of materials specified herein as follows:
 - a. Grounding Products: Include a complete grounding system diagram with materials and ground conductor sizes.
 - b. Miscellaneous Electrical Controls and Control Wiring: Include control wiring diagrams for all miscellaneous electrical controls.
 - c. Housekeeping Pads: Include location and dimensions of housekeeping pads, including blockouts and anchor bolts.
 - 5. Firestops: Include all firestop materials for the project, indicating intended use and UL fire rating where applicable.

- a. Provide "SpecSeal" products or approved equal. Provide SSB series firestop pillows (or equal) around the cable tray where cable trays make penetration in the walls, etc. Provide "LC150" series sealant (or equal) to seal the penetrations made by conduits.
6. Contractor prepared, new, detailed, dimensioned shop Drawings (PDF) for the installation of the work in the electrical equipment rooms areas shall be prepared and submitted for review. In preparing shop Drawings, establish lines and levels for the work specified and check the drawings to avoid interference with structural features and the work of other trades. Immediately call out the attention of the Engineer in writing any interferences for clarification.
7. Corrections or comments made on shop Drawings during the review do not relieve the Contractor from compliance with requirements of the contract documents. Review of shop Drawings shall not permit any deviation from Drawings and Specifications. Shop Drawings must be accompanied by signed statement from contractor, stating that he has reviewed the submittal and checked it for compliance. Contractor shall make note on the submittals if they deviate from the contract documents.
8. Contractor shall provide products as specified if submittals for review of materials are not received within thirty (30) days after award of the Contract.

1.07 PROJECT/SITE CONDITIONS

- A. Visit the site before bidding to become familiar with conditions under which the work will be performed.
- B. No additional compensation will be allowed for failure to be so informed.

1.08 CUTTING AND PATCHING

- A. Do all cutting, patching, fitting, and all other work that may be required to make the several parts come together and fit.
- B. Provide, everything required for the work or to conceal any of the work, in any part of the structure.
- C. Fireproofing:
 1. Plastic sleeves/pipe shall not be used within the building when penetrating a fire-resistant-rated wall, ceiling, partition, or floor.

1.09 RECORD DRAWINGS

- A. Upon completion of the project, provide a complete set of detailed electronic as-built drawings in AutoCAD 2018 format with all information required. Contractor shall also produce (2) sets of as-built drawings with modifications to construction documents in red ink. Contractor shall maintain a current set of as-built drawings on site at all times. As-built drawings shall include, but not be limited to detailed dimensions of all conduits, ductbank, etc. install in slab or below grade.
- B. Equipment Manuals:
 1. Before the date of substantial completion, Contractor shall furnish to the Engineer three (3) bound sets of descriptive, dimensional and parts data on all major items of electrical equipment and material including those items listed above under "Shop Drawings:".

1.10 WARRANTY/GUARANTEE

- A. Except where longer periods of warranty are specified, guarantee all labor and materials for a period of twelve (12) months from the date of substantial completion of the particular phase of the work. Repair all defective materials and work; replace with new materials and/or equipment, any material and/or equipment failing to give satisfactory service. If equipment carries a longer manufacturer warranty, then contractor shall cover equipment for the full duration of the manufacturer warranty.
- B. During the period of guarantee, promptly correct any defects in equipment, materials or workmanship without cost to the Owner.
- C. Guarantee includes equipment capacity and performance ratings specified without excessive noise levels. Any deficiencies in equipment specified shall be promptly corrected.
- D. Contractor's warranty shall include an inspection of the system one (1) week before the end of the one (1) year warranty period. Replace or repair any items found to be defective at this time.

1.11 TESTS AND BALANCING

- A. At such times as the Engineer directs, conduct operating tests to demonstrate that the electrical systems are installed and will operate properly and in accordance with the requirements of this Specification. Tests shall be performed in the presence of the Engineer's representative. Furnish instruments and personnel required for such tests.
- B. Any work and materials tested and found varying from the requirements of the Drawings and Specifications shall be replaced without additional cost to the Owner.
- C. This section does not relieve the Contractor from testing equipment installed under this Division but not listed in this section. Contractor is required to test all equipment, feeders, etc., installed under this Division. Reference specific spec sections for full testing requirements.

1.12 INTEGRATED SYSTEM TESTING

- A. Provide a coordinated functional test of Fire Alarm/Mass Notification (Section 283100), Access Control (Section 281300), Video Surveillance (Section 282300), Intercommunication and Paging System (Section 275123) and Division 26 raceway/power.
- B. Owner and Engineer shall witness integrated tests.

PART 2 PRODUCTS**2.01 GENERAL**

- A. Refer to DIVISION 1 sections for general requirements on products, materials and equipment. Refer to other DIVISION 26 sections for additional requirements.
- B. Provide products which are compatible with other products of the electrical work, and with other work requiring interface with the electrical work, including electrical connections and control devices. Determine in advance of purchase that equipment and materials proposed for installation will fit into the confines indicated, leaving adequate clearance as required by applicable codes, and for adjustment, repair, or replacement.

2.02 MANUFACTURERS' NAMEPLATES

- A. Each major component of the equipment shall have the manufacturer's name, address, model number, and rating on a plate securely affixed in a conspicuous place.

PART 3 EXECUTION**3.01 GENERAL**

- A. Visit the building site before bidding to determine existing conditions and assume all responsibility and bear all expenses in allowing for these conditions in the bid.
- B. Obtain all necessary permits, pay all legal fees and charges.
- C. No work shall be concealed until approved by the engineer and all regulations are adhered to. Provide certificate of completion.
- D. Cooperate with other trades in installing work in order that there will be no conflict of space required by conduit, piping, ducts, outlets, etc.
- E. Verify dimensions with certified shop Drawings of the materials actually approved and purchased.

3.02 TEMPORARY WIRING, LIGHTING AND POWER AT THE SITE

- A. Furnish and install provisions for temporary electrical service and construction light and power during the construction period.
- B. Furnish, install, and maintain all temporary service equipment as required until permanent service is installed, switch-over temporary systems to the permanent service when latter is ready for same.
- C. Furnish, install, maintain, and switch on and off on all regular work days a complete temporary light system, for the building while under construction.
- D. Provide any and/or all relocations of temporary electric facilities as necessary to avoid the permanent installations of all trades.

- E. Coordinate with the Utility Company for a separate construction meter. Contractor shall pay all associated costs.
- F. Contractor shall pay the monthly utility bill for the full duration of construction.

3.03 WIRING FOR EQUIPMENT BY OTHERS

- A. Electrical service for all equipment furnished under this Specification and/or indicated on the Drawings shall be roughed-in and connected under this Section.
- B. Electrical work for equipment specified in Division 25 - Mechanical shall be as specified.
- C. Raceways, outlets, backboards, cabinets, grounding connections, handholes, underground distribution system, and other roughing-in indicated shall be provided as work of this division for intercom system, telecommunication system, fire alarm system and HVAC Control 120V power (Contractor to provide cable as well).

3.04 WORKMANSHIP

- A. Install all materials and electrical components of the work in accordance with instructions of manufacturer following the best modern construction practices and conforming with the Contract Documents.
Workmanship shall be first class, in both function and appearance, whether finally concealed or exposed and shall be performed by experienced workmen skilled in the type of work. As practicable, the lines of all components of the system shall be perpendicular or parallel. In general, workmanship shall conform to guidelines set forth in N.E.C.A. manuals.

3.05 MOUNTING HEIGHTS

- A. Upon approval of the Engineer mounting heights may be adjusted.

END OF SECTION

SECTION 260051
ELECTRICAL RELATED WORK**PART 1 GENERAL****1.01 DESCRIPTION**

- A. Extent of electrical related work required by this section is indicated on Drawings and/or specified in other Division 26 sections.

1.02 PROJECT/SITE CONDITIONS

- A. Protect property from damage which might result from excavating and backfilling.
- B. Protect persons from injury at excavations by barricades, warnings and illumination.
- C. Coordinate excavations with weather conditions, to minimize possibility of washouts, settlements and other damages and hazards.

PART 2 PRODUCTS**2.01 ACCESS TO ELECTRICAL WORK**

- A. Provide removable access doors of types and sizes needed for access requirements of Electrical Equipment.

PART 3 EXECUTION**3.01 EXCAVATION, TRENCHING AND BACKFILLING**

- A. Call before you dig. Locate existing utilities prior to excavation or trenching. 811 or the toll-free number 800-227-6477.
- B. Perform all excavation of every description and of whatever substances encountered to the depths indicated on the Drawings or as otherwise specified or as required based on field condition. All excavated materials not required or not suitable for backfill shall be removed.
- C. Sheet piling and shoring shall be done as necessary for the protection of the work and for the safety of personnel. Contractor shall follow all OSHA excavation safety requirements (29 CFR 1926 Subpart P)
- D. No excavation or trenches shall be cut near or under footings without first consulting the Engineer.
- E. Provide uniform circumferential support to lower third of each conduit or pipe. Each conduit or pipe shall be laid true to line and grade to prevent sudden offset to flow line. As work progresses, interior of conduit or pipe shall be cleared of dirt and superfluous materials of every description.
- F. Provide proper supporting material as required based on field condition.
 - 1. Trenches for utilities shall be of a depth that will provide the following minimum depth of cover from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown:
 - a. 30-Inch Minimum Cover - Electrical Conduits/Cables over 600 volts
 - b. 24-inch Minimum (See NEC, latest edition) - Electrical Cables/Conduits under 600 volts.
 - 2. Backfill shall be installed in layers 6" deep, adequately wetted and tamped using materials as noted above. Refer to Division 2 for compaction densities.
 - 3. Restore all hard finished surfaces such as roadways, sidewalks, grass, shrubbery, etc., removed for installation of utilities (and not shown on Drawings or specified to be reworked under other sections of the work) to their original condition. Restore to near original condition acceptable to Architect/Engineer.
 - 4. Carefully plan all work to avoid existing utilities and other interferences. The Drawings do not indicate all existing underground utilities. Existing utility lines to be retained that are shown on the Drawings or the locations of which are made known to the Contractor prior to excavation, as well as all utility lines uncovered during excavation operations, shall be protected from damage during excavation and backfilling and, if damaged, shall be repaired by Contractor at his expense. Prior to doing any excavation with power tools, carefully investigate and locate any existing conduit, pipes, and other lines.

3.02 FOUNDATIONS AND SUPPORTS

- A. Provide concrete pedestals, bases, pads, curbs, anchor blocks, anchor bolts, slab inserts, hangers channels, cradles, saddles, etc. for installation of floor mounted equipment.
- B. Concrete pads for floor mounted electrical equipment shall be coordinated with manufacturer installation requirements (3.5-inch minimum height), unless otherwise indicated, poured integral with the floor slab wherever practical. Coordinate with Division 3 for structural requirements. Score structural slab thoroughly to assure concrete bonding between structural slab and housekeeping pad or as directed by Structural Engineer. Construct in full accordance with "concrete" specifications for 3000 psi minimum compressive strength. Finish tops of housekeeping pads smooth and level within 1 percent of span. Pads shall be extended at least 4" (10 cm) beyond the equipment outline on all four sides with chamfered edges, or as required by equipment manufacturer.

3.03 PAINTING

- A. Factory painted equipment shall have finish restored to Manufacturer's finish if scratched or damaged before acceptance or use by Owner.
- B. All exposed steel supports shall be protected and painted. Coordinate with Architect for paint color.

END OF SECTION

SECTION 260170
CIRCUIT AND MOTOR DISCONNECTS

PART 1 GENERAL**1.01 DESCRIPTION OF WORK**

- A. The work of this section consists of providing labor, materials, tools, appliances and miscellaneous accessories associated with the circuit and motor disconnect switch work indicated herein and on Drawings and schedules.
- B. Types of circuit and motor disconnect switches in this section include the following:
 - 1. Equipment disconnects.
 - 2. Appliance disconnects.
 - 3. Motor circuit disconnects.

PART 2 PRODUCTS**2.01 ACCEPTABLE MANUFACTURER**

- A. Square D
- B. Eaton
- C. Siemens
- D. ABB

2.02 FABRICATED SWITCHES

- A. Provide Heavy Duty safety switches and the best possible quality which yields the most protection for equipment and personnel for the intended use. If there is conflict between the drawings and the specifications, the contractor shall use the one that yields the most stringent protection requirements.
 - 1. Fused switches shall include the following:
 - a. All fusible switches shall accept Class R fuses and have provision for field installation of U.L. listed rejection feature.
 - b. The U.L. listed short circuit rating shall be 100,000 symmetrical amperes when Class R fuses and fuse kits are installed.
 - c. Provide Class RK1 or RK5 time-delay, dual-element fuses as coordinated with equipment manufacturer, Electrical Load Study and upstream Over Current Protection Devices (OCPDs)
 - 2. Non-Fusible switches are allowed as indicated on the drawings.
 - 3. Confirm Disconnect/Safety Switch short-circuit rating coordination with the Contractor Prepared Electrical Load Study.
 - 4. Provide Arc-Flash stickers on all Disconnect/Safety Switches as required by the Contractor Prepared Electrical Load Study.
- B. Type of Enclosure for the Different Locations:
 - 1. NEMA Type 1: Indoor use.
 - 2. NEMA Type 3R: Outdoor use.
- C. All switches shall be listed per U.L. Standard 98; comply with Federal Specifications W-S-865; comply with NEMA KS-1.

PART 3 EXECUTION**3.01 INSTALLATION OF CIRCUIT DISCONNECT SWITCHES**

- A. Install disconnect switches where indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products fulfill requirements.
- B. Provide and install fuses where applicable and/or shown on the Drawings.
- C. Install label nameplate as required by Electrical Identification Specification Section.
- D. Disconnect/Safety Switches shall be grounded per the NEC.

END OF SECTION

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Service entrance cable.
- C. Metal-clad cable.
- D. Wiring connectors.
- E. Electrical tape.
- F. Heat shrink tubing.
- G. Oxide inhibiting compound.
- H. Wire pulling lubricant.
- I. Cable ties.
- J. Firestop sleeves.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2024.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- H. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.
- I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- J. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- N. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

- P. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- R. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.
- S. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
 - 3. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Engineer/Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Metal-clad cable is permitted only as follows:

1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet (1.8 m).

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- E. Comply with NEMA WC 70.
- F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- H. Conductors for Grounding and Bonding: Also comply with Section 260526.
- I. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- J. Conductor Material:
 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 3. Tinned Copper Conductors: Comply with ASTM B33.
- K. Minimum Conductor Size:
 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
 - 3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.
- L. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- M. Conductor Color Coding:
 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 3. Color Code:
 - a. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - c. Equipment Ground, All Systems: Green.
 - d. Travelers for 3-Way and 4-Way Switching: Pink.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 - 1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. Encore Wire Corporation: www.encorewire.com/#sle.
 - c. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.
 - d. Southwire Company: www.southwire.com/#sle.
 - e. Or Approve Equal.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Stranded.
 - b. Size 8 AWG and Larger: Stranded.
 - 2. Control Circuits: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. Size 4 AWG and Larger: Type XHHW-2.
 - b. Installed Underground: Type XHHW-2.
 - c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.04 SERVICE ENTRANCE CABLE

- A. Manufacturers:
 - 1. Copper Service Entrance Cable:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. Encore Wire Corporation: www.encorewire.com/#sle.
 - c. Southwire Company: www.southwire.com/#sle.
- B. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2 and with UL 44 Type RHH/RHW-2.
- C. Conductor Stranding: Stranded.
- D. Insulation Voltage Rating: 600 V.

2.05 METAL-CLAD CABLE

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Stranded.
 - 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Grounding: Full-size integral equipment grounding conductor.
- F. Armor: Steel, interlocked tape.

2.06 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 260526.
- C. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use mechanical connectors or Barrel Crimp Sleeves.
 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or Barrel Crimp Sleeves.
- D. Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for Barrel Crimp connectors. Wire nuts are not allowed.
- G. Mechanical connectors: Provide bolted type or set-screw type.
1. Manufacturers:
 - a. Burndy LLC; _____: www.burndy.com/#sle.
 - b. IlSCO: www.ilSCO.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Or Approved Equal.
- H. Compression Connectors: Provide circumferential type or hex type crimp configuration.
1. Manufacturers:
 - a. Burndy LLC; _____: www.burndy.com/#sle.
 - b. IlSCO: www.ilSCO.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Or Approved Equal.

2.07 ACCESSORIES

- A. Electrical Tape:
1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
 2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
 5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
 6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).

- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
- E. Cable Ties: Material and tensile strength rating suitable for application.
- F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70 and these specifications.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated without specific routing, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
 - 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 - 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 - 7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
 - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
 - b. Increase size of conductors as required to account for ampacity derating.
 - c. Size raceways, boxes, etc. to accommodate conductors.
 - 8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Conductor ampacities shall be determined in accordance with the NEC, including adjustments and corrections for conditions of use (ambient temperature, conductor bundling, etc.). Continuous loads shall not exceed 80% of the overcurrent protective device rating, unless otherwise permitted by the NEC.
- D. The system shall be grounded and conductors color-coded in accordance with these specifications and the NEC.
- E. Do not use mechanical means to pull wire No. 8 AWG. or smaller.
- F. Type AC or MC cable is not allowed except as allowed in this spec.
- G. Perform work in accordance with NECA 1 (general workmanship).

- H. Install metal-clad cable (Type MC) in accordance with NECA 120.
- I. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- J. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- K. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 - 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- L. Terminate cables using suitable fittings.
 - 1. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- M. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- N. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet (1.5 m) of slack.
- O. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- P. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- Q. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitably remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
 - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- R. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
 - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
 - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

- 3. Wet Locations: Use heat shrink tubing.
- S. Insulate ends of spare conductors using vinyl insulating electrical tape.
- T. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible. Provide at all terminations, junction boxes, and accessible points.
- U. Identify conductors and cables in accordance with Section 260553.
- V. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- W. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Prior to energization, test cable and wire for continuity of circuitry and for short circuits.
- C. Inspect and test in accordance with NETA ATS, except Section 4.
- D. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required. Only insulation resistance testing is expected.
 - 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- E. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.

1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
 - 1. Includes oxide inhibiting compound.
- B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.
- D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify exact locations of underground metal water service pipe entrances to building.
 - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 3. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- B. Shop Drawings:
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Field quality control test reports.
- E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

1.08 DESCRIPTION OF WORK

- A. The work of this section consist of providing labor, materials, tools, appliances and miscellaneous Accessories associated with grounding of the electrical system as required by and as indicated herein and/or on the drawings.
- B. Main electrical service equipment, raceways, motors, panelboards and other electrical equipment shall be effectively and permanently grounded to the grounding electrode system. This electrode shall be the nearest available effectively grounded structural metal member of the structure or the nearest available effectively grounded metal water pipe and also a driven rod. Grounding connections and conductor sizes shall be in accordance with the requirements of the National Electrical Code, Article 250, local ordinances, and as described herein.
- C. A separate grounding conductor, sized in accordance with NEC Table 250-122 shall be provided in the conduit with the circuit conductors for all feeder and branch circuits. The grounding conductor may be bare or insulated copper; however, if this conductor is insulated, the insulating covering shall be green in color. Where bare copper grounding conductors are used, mark the conductor ends with green tape. Conduit runs shall be increased in size where necessary to accommodate the grounding conductor in addition to circuit conductors. The electrical continuity of all conduit runs shall be verified and corrected where necessary.
- D. Isolated Ground Connectors shall be insulated. Additional grounding conductors and conduit shall be provided as specified herein or shown on the drawings. All conduit for grounding system conductors, not run in conduit with circuit conductors, shall be rigid steel conduit.
- E. All electrical equipment enclosures and conductor enclosures shall be grounded. This includes but is not limited to metal raceways, outlet boxes, cabinets, switch boxes, work stations, motor frames, transformer cases and metallic enclosure for all electrical equipment.
- F. Under no circumstances shall neutral conductors again be grounded after they have been grounded once at the transformer secondary except at a separately derived system.
- G. Panelboards shall be equipped with a neutral bar which is insulated from the enclosure, and a grounding bar which is bonded to the enclosure. The grounding bar shall provide for terminating the green equipment grounding conductors in the panelboard or motor control center cabinets. Neutral busses shall be isolated from ground except at the main bonding jumper.
- H. Types of grounding in this section includes the following:
 - 1. Underground metal water piping.
 - 2. Grounding electrodes
 - 3. Service Equipment
 - 4. Enclosures
 - 5. Systems
 - 6. Equipment
- I. Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.
- J. Provide bonding jumper across water meter. The bonding jumper shall be the same size as the grounding electrode conductor and long enough to allow the meter to be removed without disconnecting the bonding jumper.

PART 2 PRODUCTS**2.01 GROUNDING AND BONDING REQUIREMENTS**

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Engineer/Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
- E. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Metal Underground Water Pipe(s):
 - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
 - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
 - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
 - 3. Metal In-Ground Support Structure:
 - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
 - 4. Concrete-Encased Electrode:
 - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
 - 5. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
 - c. Where location is not indicated, locate electrode(s) at least 5 feet (1.5 m) outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
 - 6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
 - 7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
 - a. Ground Bar Size: as shown on drawings unless otherwise indicated or required.
 - b. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.
- F. Separately Derived System Grounding:
 - 1. Separately derived systems include, but are not limited to:

- a. Transformers (except autotransformers such as buck-boost transformers).
 2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
 3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
 4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
 5. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
 6. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.
- G. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
 7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
 - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
 - b. Metal gas piping.
 8. Provide bonding for interior metal air ducts.
 9. Provide bonding for metal building frame.
 10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.
- H. Telecommunications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
 2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
 - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
 - b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
 - c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
 - d. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
- C. Connectors for Grounding and Bonding:
 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 3. Unless otherwise indicated, use mechanical connectors or exothermic welded connections for accessible connections.
- D. Ground Bars:
 1. Description: Copper rectangular ground bars with mounting brackets and insulators.
 2. Size: As indicated.
 3. Holes for Connections: As indicated or as required for connections to be made.
- E. Ground Rod Electrodes:
 1. Comply with NEMA GR 1.
 2. Material: Copper-bonded (copper-clad) steel.
 3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.
 4. Where rod lengths of greater than 10 feet (3.0 m) are indicated or otherwise required, sectionalized ground rods may be used.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Weld grounding conductors to underground grounding electrodes/grounding ring. The building equipment grounding system shall consist of the ground wire and electrically continuous metallic conduit system. Every item of equipment served by the electrical system shall be bonded to the building equipment ground. Metallic piping and duct systems which are electrically isolated shall be bonded to the equipment grounding system with a flexible bonding jumper.
- D. The neutral shall be grounded to the grounding electrode system at the service entrance only, and shall be kept isolated from the building grounding system throughout the building. The neutral of separately derived systems shall be grounded at one point as specified herein below.
- E. Continuity of the building equipment grounding system shall be maintained throughout the project. Grounding jumpers shall be installed across conduit expansion fittings, all liquid-tight flexible metal and flexible metal conduit, light fixture pigtails in excess of 6' and all other non-electrically continuous raceway fittings.
- F. All main grounding conductors shall be stranded copper conductors, sized as shown and/or required, and run in a suitable raceway. All main grounding conductors shall be continuous without joints or splices over their entire length.
- G. Ground telecommunication service equipment as required by local utility.
- H. Flexible conduit longer than 6' shall not be considered a ground path.
- I. Ground all grounding-type receptacles with a separate ground wire.

- J. Grounding of all motors or equipment connected to terminal box with flexible conduit shall be made with a separate grounding conductor between motor frame or equipment cabinet and rigid conduit system. Grounding conductor shall be sized in accordance with table 250-122 of the NEC.
- K. All grounding conductors shall be amply protected from mechanical injury and shall be supported in an approved manner. Where conductors are located in concrete, they shall be installed in conduit. Where ground conductors enter or emerge from slabs bearing directly on fill or soil, the voids between the conductor and the surrounding conduit shall be filled with compound to provide an effective water seal.
- L. Grounding conductors shall be not smaller than #12 AWG. Conductors shall be high conductivity copper, and sizes larger than #12 shall be stranded.
- M. Insulated bushings shall be installed on all raceways at transformers, switchboards, motor control centers, dry-type transformers, as well as switches used as service equipment.
- N. Install braided type bonding jumpers with clamps on water meter piping to electrically bypass the water meter.
- O. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.
- P. Ground each steel structural column to the grounding electrode system. "Cadweld" grounding conductor to steel column.
- Q. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70.
 - 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 12 inches below finished grade.
 - 2. Indoor Installations: Unless otherwise indicated, install with 4 inches (100 mm) of top of rod exposed.
- R. Make grounding and bonding connections using specified connectors.
 - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- S. Identify grounding and bonding system components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements. Measured ground resistances shall be 5 ohms or less.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- B. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- C. Section 265100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
- D. Section 265600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
- B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- C. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.
- D. Installer's Qualification Statement: Include evidence of compliance with specified requirements.

- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.
- C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- D. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURED SUPPORTING DEVICES

- A. General: Provide supporting devices complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation and as herein specified. Where more than one type of device meets indicated requirements, selection is Installer's option.
- B. Support: Provide supporting devices of types, sizes and materials as required and having the following construction features:
 - 1. Clevis Hangers: For supporting 2" rigid metal conduit, galvanized steel with 1/2" diameter hole for round galvanized or stainless steel rod, approximately 54 pounds per 100 units.
 - 2. Riser Clamps: For supporting 5" rigid metal conduit, galvanized steel with 2 bolts and nuts and 4" ears, approximately 510 pounds per 100 units.
 - 3. Reducing Couplings: Steel rod reducing coupling, 1/2" x 5/8" galvanized or stainless steel approximately 16 pounds per 100.
 - 4. C-Clamps: Malleable iron, 1/2" rod size, approximately 70 pounds per 100 units.
 - 5. I-Beam Clamps: Steel, 1-1/4" x 3/16" stock, 3/8" cross bolt, flange width 2", approximately 52 pounds per 100 units.
 - 6. One-Hole Conduit Straps: For supporting 3/4" rigid metal conduit, galvanized steel, approximately 7 pounds per 100 units. Include with backing plates.
 - 7. Two-Hole Conduit Straps: For supporting 3/4" rigid metal conduit, galvanized steel, 3/4" strap width, and 2-1/8" between center of screw holes.
 - 8. Round Steel Rod: Hot dipped galvanized or Stainless Steel, 1/2" diameter, approximately 67 pounds per 100 feet.
 - 9. Hexagon Nuts: For 1/2" rod size, galvanized steel, approximately 4 pounds per 100 units.
 - 10. Offset Conduit Clamps: For supporting 2" rigid metal conduit, steel approximately 200 pounds per 100 units.
- C. Anchors: Provide anchors of types, sizes and materials as required and having the following construction features:
 - 1. Lead Expansion Anchors: 1/2", approximately 38 pounds over 100 units.
 - 2. Toggle Bolts: Springhead, 3/16" x 4", approximately 5 pounds per 100 units.
 - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering anchors which may be incorporated into the work include, but are not limited to the following:
 - a. Hilti
 - b. Powers/Dewalt
 - c. ITW/Red Head
 - d. Simpson Strong-Tie
- D. U-Channel Strut System:

1. Provide U-Channel strut system for supporting electrical equipment, 16-gage hot dip galvanized steel or stainless steel, of types and sizes required: construct with 9/16" diameter holes, 8" on center on top surface, and with the following fittings which mate and match with U-channel:
 - a. Fixture Hangers
 - b. Channel Hangers
 - c. End caps
 - d. Beam clamps
 - e. Wiring stud
 - f. Thinwall conduit clamps
 - g. Rigid conduit clamps
 - h. Conduit hangers
 - i. U-bolts
 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel system which may be incorporated in the work include, but are not limited to, the following:
 - a. Eaton B-Line
 - b. Unistrut
 - c. Cooper Caddy
 - d. Superstrut
- E. General Requirements:
1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 3. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Exterior or Damp and Wet Locations: Stainless Steel Type 304 or 316 or Epoxy-coated carbon steel.
 - c. Exterior or Damp and Wet Locations: Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
 - d. Do not use plain uncoated carbon steel in any location.
 - e. Provide anchors of the same material as adjacent supports.
- F. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

2.02 FABRICATED SUPPORTING DEVICES

- A. Pipe Sleeves: Provide pipe sleeves of one of the following:
1. Sheet-Metal: Fabricate from galvanized sheet metal round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gages: 3" and smaller, 20 gage; 4" or 6", 16 gage; over 6", 14 gage.
 2. Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
 3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
 4. Plastic-Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.
- B. Sleeve Seals: Provide Lead and Oakum sleeve seals, caulked between sleeve and pipe for sleeves located in foundation walls below grade or in exterior walls.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Engineer/Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Engineer/Architect, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.
- K. Tighten sleeve seal nuts until sealing grommets have expanded to form a watertight seal.
- L. Coordinate all conduit penetrations into the building from the exterior with Division 1.

3.03 FIELD QUALITY CONTROL

- A. Inspect support and attachment components for damage and defects.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

- D. Provide required support and attachment in accordance with Section 260529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Furnish and set all inserts, anchors, studs, and hangers for the support of lighting fixtures and respective equipment, and make all necessary adjustments as required.
- G. In acoustical tile ceiling with concealed mechanical suspension system and in gypboard or plaster ceilings, recessed troffers shall be flanged type fixtures. In acoustical tile ceilings with exposed mechanical suspension systems, troffers shall be lay-in type.
- H. For any type ceiling provide sufficient support for fixtures, either arrange with other subcontractors to strengthen ceiling or support fixtures from structure above independently of ceiling. Regardless of whether or not the ceiling can support the fixtures, provide securing wiring on fixture to structure. Provide a minimum of two securing wires to 2x4, 2x2, etc. NOTE: Securing wires are not the same as support wires. Securing wires are for preventing a fixture from falling into a space if the ceiling fails under a fire situation.
- I. All lay-in fixtures shall be connected to grid system with hurricane clips.
- J. Fixtures to be installed in or on painted ceilings and/or walls shall not be installed until painting is completed. Fixtures installed with paint applied over factory finishes will be rejected.
- K. Suspended Ceiling Mounted Luminaires:
 - 1. Do not use ceiling tiles to bear weight of luminaires.
 - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 - 3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
 - 4. Secure pendant-mounted luminaires to building structure.
 - 5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 - 6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
- L. Recessed Luminaires:
 - 1. Install trims tight to mounting surface with no visible light leakage.
 - 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
 - 3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- M. Suspended Luminaires:
 - 1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
 - 2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
 - 3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet (1.2 m) between supports.
 - 4. Install canopies tight to mounting surface.
 - 5. Unless otherwise indicated, support pendants from swivel hangers.
- N. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- O. Install accessories furnished with each luminaire.
- P. Bond products and metal accessories to branch circuit equipment grounding conductor.
- Q. Emergency Lighting Units:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- R. Exit Signs:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

**SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. PVC-coated galvanized steel rigid metal conduit (RMC).
- C. Flexible metal conduit (FMC).
- D. Liquidtight flexible metal conduit (LFMC).
- E. Electrical metallic tubing (EMT).
- F. Rigid nonmetallic conduit
- G. Underground PVC Conduit (PVC)
- H. Conduit fittings.
- I. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
 - 1. Includes additional requirements for fittings for grounding and bonding.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- E. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2025.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- G. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- L. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- M. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
- N. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- P. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 - 5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- C. Shop Drawings:
 - 1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
 - 2. Include proposed locations of roof penetrations and proposed methods for sealing.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS**2.01 CONDUIT APPLICATIONS**

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Install fire alarm and MNS circuits per survivability levels in Section 283100.
- D. Underground:
 - 1. Exterior, Direct-Buried: Use Rigid PVC Conduit
 - 2. Where rigid pvc conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
 - 3. Where rigid polyvinyl (PVC) conduit is provided, use galvanized steel rigid metal conduit elbows for bends.
 - 4. Where steel conduit is installed in direct contact with earth, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
- E. Concealed Within Masonry Walls: Use electrical metallic tubing (EMT).
- F. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).

- G. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).
- H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit.
- J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
- K. Exposed, Exterior: Use galvanized steel rigid metal conduit.
- L. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
 - 1. Maximum Length: 6 feet (1.8 m).
- M. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.

2.02 CONDUIT REQUIREMENTS

- A. Electrical Service Conduits: Also comply with Section 262100.
- B. Fittings for Grounding and Bonding: Also comply with Section 260526.
- C. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Underground, Exterior: 1 inch (27 mm) trade size.
- F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit
 - 2. Republic Conduit
 - 3. Wheatland Tube, a Division of Zekelman Industries
 - 4. Or Approved Equal.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc
 - b. O-Z/Gedney, a brand of Emerson Electric Co
 - c. Thomas & Betts Corporation
 - d. Or Approved Equal.
 - 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).

- C. PVC-Coated Fittings:
 - 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
 - 2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - 4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).
- D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

2.05 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.07 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
 - 1. Allied Tube & Conduit
 - 2. Republic Conduit
 - 3. Wheatland Tube, a Division of Zekelman Industries
- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc
 - b. O-Z/Gedney, a brand of Emerson Electric Co
 - c. Thomas & Betts Corporation
 - d. Or Approved Equal.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - 4. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
 - 1. Cantex Inc
 - 2. Carlon, a brand of Thomas & Betts Corporation
 - 3. JM Eagle
- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- C. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.09 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).
- E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- F. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.
- G. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- H. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
- I. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- F. Methods of Installation:
 - 1. Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean.
 - 2. Field-bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.
 - 3. Minimum Interior conduit size shall be 3/4", Exterior shall be 1"
 - 4. Conduit Fill:
 - a. 53% of cross-sectional area for a single conductor
 - b. 31% for two conductors
 - c. 40% for three or more conductors
 - d. In no case shall conductors be installed in conduit in a manner that violates NEC derating or heat dissipation requirements.
 - e. Where voltage drop requires upsizing of conductors, conduit shall be sized accordingly to maintain compliance with the above fill requirements.
 - 5. Conduits when entering watertight enclosures shall be secured with a myers hub.
 - 6. Fasten conduit terminations in sheet metal enclosures by 2 locknuts, and terminate with bushing. Install locknuts inside and outside enclosure.
 - 7. Install conduits as not to damage or run through structural members.
 - 8. Test every conduit run installed with ball mandrel. Clear and restore/repair and conduit which rejects ball mandrel.

9. Provide permanent plastic tags at each end of embedded conduit run stating what the conduit is serving and where it is served from including the location.
 10. Label all junction boxes (larger than 6" x 6"); pull boxes, wireways with engraved plastic nameplates.
 11. Run all underground conduit under the slab in the dirt and hung from the slab except for miscellaneous 3/4" conduits which may be run in the slab (with approval from Structural Engineer) if the below stated conditions are met. The depth shall vary as required to avoid underground plumbing. Run in slab when turning up. Hang conduit to slab with stainless steel rods looped around conduit with stainless steel washer to keep loop closed on one end; the other end is to have a 90 degree bend set into slab or looped around reinforcing rods. Use 1/4" diameter rod for conduit up to 2", 3/8" diameter for conduit 2 1/2" or greater in diameter. Space supports no greater than 4' apart, or as required by the National Electrical Code and local codes.
 12. Install underground conduits minimum of 24" below finished grade. Use 36" radius long fittings only.
 13. Exposed Conduits:
 - a. Install exposed conduits and extensions from concealed conduit systems neatly, parallel with, or at right angles to walls of the building.
- G. Conduit Routing:
1. Unless dimensioned, conduit routing indicated is diagrammatic.
 2. When conduit destination is indicated without specific routing, determine exact routing required.
 3. Conceal all conduits unless specifically indicated to be exposed.
 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 5. Arrange conduit to maintain adequate headroom, clearances, and access.
 6. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 7. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
 8. Route conduits above water and drain piping where possible.
 9. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 10. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
 11. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.
 12. Group parallel conduits in the same area together on a common rack.
- H. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
- I. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.

5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
 7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- K. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where conduits are subject to earth movement by settlement or frost.
- L. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
 3. Where conduits penetrate coolers or freezers.
- M. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.
- N. Provide grounding and bonding in accordance with Section 260526.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 260533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- C. Boxes and enclosures for integrated power, data, and audio/video.
- D. Floor boxes.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- C. Section 260526 - Grounding and Bonding for Electrical Systems.
- D. Section 260529 - Hangers and Supports for Electrical Systems.
- E. Section 260533.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- F. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 262726 - Wiring Devices:
 - 1. Wall plates.
 - 2. Floor box service fittings.
 - 3. Additional requirements for locating boxes for wiring devices.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013 (Reaffirmed 2020).
- F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- L. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
- M. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
 - 6. Coordinate the work with other trades to preserve insulation integrity.
 - 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
 - 8. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS**2.01 BOXES**

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use suitable concrete type boxes where flush-mounted in concrete.
 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 6. Use shallow boxes where required by the type of wall construction.
 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 10. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
 11. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 12. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 13. Minimum Box Size, Unless Otherwise Indicated:
 - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
 14. Wall Plates: Comply with Section 262726.
 15. Manufacturers:
 - a. Eaton Crouse-Hinds
 - b. Hubbell Incorporated; Bell Products:
 - c. Hubbell Incorporated; RACO Products:
 - d. Arlington Industries
 - e. Allied Moulded Products
 - f. Orbit Industries
 - g. Legrand (Pass & Seymour / Wiremold)
 - h. Appleton (Emerson)
 - i. Or Approved Equal.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 12 painted steel.
 - b. Outdoor Locations: Type 3R, painted steel.
 3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
 - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
 - b. Back Panels: Painted steel, removable.
 - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
 5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
 6. Manufacturers:
 - a. Eaton B-Line
 - b. nVent Hoffman
 - c. Hubbell Wiegmann
 - d. Rittal

- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
- E. Floor Boxes:
 - 1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
 - 2. Use sheet-steel or cast iron floor boxes within slab above grade.
 - 3. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
 - 4. Manufacturer: Same as manufacturer of floor box service fittings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Round boxes are not acceptable where conduit must enter box through side of box.
- I. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- J. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
 - 2. Unless dimensioned, box locations indicated are approximate.
 - 3. Locate boxes as required for devices installed under other sections or by others.
 - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
 - 4. Locate boxes so that wall plates do not span different building finishes.
 - 5. Locate boxes so that wall plates do not cross masonry joints.
 - 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
 - 8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
 - b. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area.

9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
- K. Box Supports:
 1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- L. Install boxes plumb and level.
- M. Flush-Mounted Boxes:
 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- N. Install boxes as required to preserve insulation integrity.
- O. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- Q. Close unused box openings.
- R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- S. Provide grounding and bonding in accordance with Section 260526.
- T. Identify boxes in accordance with Section 260553.

3.03 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Electrical identification requirements.
- B. Exposed conduit color banding
- C. Cable/Conductor Identification
- D. Operation Instructions and Warnings
- E. Danger Signs
- F. Equipment/System Identification Signs
- G. Identification nameplates and labels.
- H. Wire and cable markers.
- I. Voltage markers.
- J. Underground warning tape.
- K. Floor marking tape.
- L. Warning signs and labels.

1.02 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2023.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.
- E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- B. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70 and NFPA 70E

1.06 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS**2.01 ELECTRICAL IDENTIFICATION MATERIALS**

- A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.
- B. Color-Coded Conduit Markers: Provide manufacturer's standard pre-printed, flexible or semi-rigid, permanent, plastic-sheet conduit markers. Except as otherwise indicated, provide lettering which indicates voltage of conductor(s) in conduit. Unless otherwise indicated or required by governing regulations, provide orange markers with black letters.
- C. Arc Flash Hazard Warning Labels: Contractor shall provide and install all arc flash hazard warning labels as required by NFPA 70E. Contractor shall provide all fault current studies necessary to provide appropriate labels on all equipment. Coordinate with Section 26 - Electrical Load Study
- D. Cable/Conductor Identification Bands: Provide manufacturer's standard vinyl-cloth, self-adhesive cable/conductor wire markers or wrap-around type, numbered to show circuit identification.
- E. Self-adhesive Plastic Signs: Provide manufacturer's standard, self-adhesive or pressure-sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings, of sizes suitable for application areas and adequate for visibility. Unless otherwise indicated or required by governing regulations, provide orange signs with black lettering.
- F. Danger Signs: Provide Manufacturer's standard "Danger" signs of baked enamel finish on 20-gage steel, of standard red, black, and white graphics for adequate vision (as examples: "High Voltage", "Keep Away", "Buried Cable", "Do Not Touch Switch").
- G. Engraved Plastic-Laminate Signs: Provide engraved stock melamine plastic-laminate, complying with FS L-P-387 in sizes and thicknesses indicated.
 - 1. Thickness: 1/16", for units up to 20 sq. in. or 8" length, 1/8" for larger units.
 - 2. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.
- H. Manufacturers: Subject to compliance with requirements.

2.02 LETTERING AND GRAPHICS

- A. Coordinate names, abbreviations, and other designations used in electrical identification work with corresponding designations shown or specified for schedule. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical system and equipment.
- B. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces.
 - b. Transformers:
 - 1) Identify kVA rating.
 - 2) Identify voltage and phase for primary and secondary.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify load(s) served. Include location when not within sight of equipment.
 - c. Enclosed Contactors:

- 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify coil voltage.
 - 4) Identify load(s) and associated circuits controlled. Include location.
2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
3. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
4. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
5. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
6. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances.
 - a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches (76 mm) wide, painted in accordance with Section 099123 and 099113.
7. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
 - a. Service equipment.
 - b. Elevator control panels.
8. Arc Flash Hazard Warning Labels: Comply with Section 260573.
9. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
- C. Identification for Raceways:
 1. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
 2. Use underground warning tape to identify underground raceways.
- D. Identification for Devices:
 1. Use engraved wallplate to identify serving branch circuit for all receptacles.
 - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

2.03 VOLTAGE MARKERS

- A. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- B. Minimum Size:
 1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).
- C. Legend:
 1. Markers for Voltage Identification: Highest voltage present.
- D. Color: Black text on orange background unless otherwise indicated.

2.04 UNDERGROUND WARNING TAPE

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:
 1. Tape for Buried Power Lines: Black text on red background.
 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.05 FLOOR MARKING TAPE

- A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches (76 mm) wide, with alternating black and white stripes. Locations and Boundaries shall comply with NFPA 70E approach boundaries; do not cover egress paths.

PART 3 EXECUTION**3.01 PREPARATION**

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. General Installation Requirements:
 - 1. Coordination: Where identification to be applied to surfaces which require finish, install identification after completion of painting.
 - 2. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.
- C. Conduit Identification:
 - 1. General: Apply color-coded identification on electrical conduit in a manner similar to piping identification. Except as otherwise indicated, use orange with black text.
- D. Cable/Conductor Identification:
 - 1. Apply cable/conductor identification on each box/enclosure/cabinet where wires are present, match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project electrical work.
 - 2. All conductors shall be clearly and permanently identified, and color coded per NEC.
 - 3. All control circuit and instrument circuit terminations shall be identified. For conductors #6 and smaller, conductor color-coding shall be color insulation. For conductor color coding of conductors larger than #6, use self-adhesive wrap around tape markers. Use markers for all panelboards, boxes, outlets, switches, circuit breakers and control centers.
 - 4. Operational Instructions and Warnings: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical and other related systems, and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instructions or warnings on switches, outlets and other control devices and covers of electrical enclosures.
- E. Equipment/System Identification:
 - 1. Install engraved plastic-laminate sign on each major unit of electrical equipment in the building unless unit is specified with its own self-explanatory identification.
 - 2. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for the following categories of electrical work:
 - a. Panelboards, electrical cabinets and enclosures
 - b. Access panel/doors to electrical facilities
 - c. Major electrical substation and switchboard
 - d. Disconnect/safety switches
 - e. Telecommunications switching equipment
 - f. Fire Alarm Master Station

4.01 FIELD QUALITY CONTROL

- A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 260573
POWER SYSTEM STUDIES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Short-circuit study.
- B. Protective device coordination study.
- C. Arc flash and shock risk assessment.
 - 1. Includes arc flash hazard warning labels.
- D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.02 RELATED REQUIREMENTS

- A. Section 260553 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.
- B. Section 262416 - Panelboards.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.
- B. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).
- C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).
- D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.
- E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.
- F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).
- G. NEMA MG 00001 - Motors and Generators; 2024.
- H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
 - 2. Coordinate with utility for service information.
 - 3. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Submit study reports prior to or concurrent with product submittals.
 - 2. Do not order equipment until matching study reports and product submittals have both been evaluated by Engineer/Architect.
 - 3. Verify naming convention for equipment identification prior to creation of final drawings, reports, and arc flash hazard warning labels (where applicable).

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Study preparer's qualifications.

- C. Study reports, stamped or sealed and signed by study preparer.
- D. Product Data: In addition to submittal requirements specified in other sections, include manufacturer's standard catalog pages and data sheets for equipment and protective devices indicating information relevant to studies.
 - 1. Include characteristic time-current trip curves for protective devices.
 - 2. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 - 3. Include documentation of listed series ratings.
 - 4. Identify modifications made in accordance with studies that:
 - a. Can be made at no additional cost to Owner.
- E. Arc Flash Hazard Warning Label Samples: One of each type and legend specified.
- F. Field quality control reports.
- G. Certification that field adjustable protective devices have been set in accordance with requirements of studies.
- H. Project Record Documents: Revise studies as required to reflect as-built conditions.
 - 1. Include hard copies with operation and maintenance data submittals.
 - 2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

1.06 POWER SYSTEM STUDIES

- A. Scope of Studies:
 - 1. Perform analysis of new electrical distribution system as indicated on drawings.
 - 2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of identified (selected) source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
- B. General Study Requirements:
 - 1. Comply with NFPA 70.
 - 2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.
- C. Data Collection:
 - 1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
 - a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information. Utility fault current data must be up-to-date. Provide written confirmation from utility.
 - b. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 00001 code letter designation.
 - c. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
 - d. Protective Devices:
 - 1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
 - 2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
 - e. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
 - f. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.
- D. Short-Circuit Study:

1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
 2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
 - a. Maximum utility fault currents.
 - b. Maximum motor contribution.
 - c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
 3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.
- E. Protective Device Coordination Study:
1. Comply with applicable portions of IEEE 242 and IEEE 399.
 2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
 3. Analyze protective devices and associated settings for suitable margins between time-current curves to achieve full selective coordination while providing adequate protection for equipment and conductors.
- F. Arc Flash and Shock Risk Assessment:
1. Comply with NFPA 70E.
 2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
 3. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
 - a. Maximum and minimum utility fault currents.
 - b. Maximum and minimum motor contribution.
 - c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
- G. Study Reports:
1. General Requirements:
 - a. Identify date of study and study preparer.
 - b. Identify study methodology and software product(s) used.
 - c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
 - d. Identify base used for per unit values.
 - e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
 - f. Include conclusions and recommendations.
 2. Short-Circuit Study:
 - a. For each scenario, identify at each bus location:
 - 1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
 - 2) Fault point X/R ratio.
 - 3) Associated equipment short circuit current ratings.
 - b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
 3. Protective Device Coordination Study:
 - a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.
 - b. For each graph include (where applicable):
 - 1) Partial single-line diagram identifying the portion of the system illustrated.
 - 2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
 - 3) Conductors: Damage curves.

- 4) Transformers: Inrush points and damage curves.
- 5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
- 6) Motors: Full load current, starting curves, and damage curves.
- 7) Capacitors: Full load current and damage curves.
- c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
 - 1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
 - 2) Include ground fault pickup and delay.
 - 3) Include fuse ratings.
 - 4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.
- d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.
- 4. Arc Flash and Shock Risk Assessment:
 - a. For each scenario, identify at each bus location:
 - 1) Calculated incident energy and associated working distance.
 - 2) Calculated arc flash boundary.
 - 3) Arcing fault current.
 - 4) Clearing time.
 - 5) Arc gap distance.
 - b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.
 - c. Include recommendations for reducing the incident energy at locations where the calculated maximum incident energy exceeds 8 calories per sq cm.
 - d. Provide arc energy reduction means in compliance with NEC 240.87 for all circuit breakers rated 1200 amperes and above. Acceptable methods include zone-selective interlocking, differential relaying, energy-reducing maintenance switches, or approved equivalent technologies. The selected method shall be identified in the study, implemented in equipment settings, and demonstrated during acceptance testing.

1.07 QUALITY ASSURANCE

- A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in the preparation of studies of similar type and complexity using specified computer software.
 - 1. Study preparer may be employed by the manufacturer of the electrical distribution equipment.
- B. Field Testing Agency Qualifications: Independent testing organization specializing in testing, analysis, and maintenance of electrical systems with minimum five years experience; NETA Accredited Company.
- C. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.
 - 1. Acceptable Software Products:
 - a. EasyPower LLC
 - b. ETAP/Operation Technology, Inc
 - c. Power Analytics Corporation
 - d. SKM Systems Analysis, Inc

PART 2 PRODUCTS

2.01 ARC FLASH HAZARD WARNING LABELS

- A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
 - 1. Materials: Comply with Section 260553.
 - 2. Minimum Size: 4 by 6 inches (100 by 150 mm).

3. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
 - a. Include orange header that reads "WARNING" where calculated incident energy is less than 40 calories per square cm.
 - b. Include red header that reads "DANGER" where calculated incident energy is 40 calories per square cm or greater.
 - c. Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required". Include NFPA 70E mandatory label content (incident energy, PPE category or detailed PPE, shock boundaries, working distances)
 - d. Include the following information:
 - 1) Arc flash boundary.
 - 2) Available incident energy and corresponding working distance.
 - 3) Nominal system voltage.
 - 4) Date calculations were performed.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install arc flash hazard warning labels in accordance with Section 260553.

3.02 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Adjust equipment and protective devices for compliance with studies and recommended settings.
- D. Notify Engineer/Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.
- E. Submit detailed reports indicating inspection and testing results, and final adjusted settings.

3.03 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.
- B. See Section 017900 - Demonstration and Training, for additional requirements.

END OF SECTION

SECTION 262200
LOW-VOLTAGE TRANSFORMERS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. General purpose transformers.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.13 - Conduit for Electrical Systems: Flexible conduit connections.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 262416 - Panelboards.

1.03 REFERENCE STANDARDS

- A. IEEE C57.12.91 - IEEE Standard Test Code for Dry-Type Distribution and Power Transformers
- B. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.
- C. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.
- D. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.
- G. NEMA ST 20 - Dry Type Transformers for General Applications; 2021.
- H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- I. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.
- J. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.
 - 1. Vibration Isolators: Include attachment method and rated load and deflection.
- B. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.

- C. Source Quality Control Test Reports: Include reports for tests designated in NEMA ST 20 as design and routine tests.
- D. Field Quality Control Test Reports.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Maintenance Data: Include recommended maintenance procedures and intervals.
- G. Project Record Documents: Record actual locations of transformers.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Ambient Temperature: Do not exceed 86 degrees F (30 degrees C) average or 104 degrees F (40 degrees C) maximum measured during any 24 hour period during and after installation of transformers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB / GE
- B. Eaton Corporation
- C. Schneider Electric; Square D Products
- D. Siemens Industry, Inc
- E. Source Limitations: Furnish transformers produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 TRANSFORMERS - GENERAL REQUIREMENTS

- A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.
- B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
 - 1. Altitude: Less than 3,300 feet (1,000 m).
 - 2. Ambient Temperature:
 - a. Greater than 10 kVA: Not exceeding 104 degrees F (40 degrees C).
 - b. Less than 10 kVA: Not exceeding 77 degrees F (25 degrees C).
 - 3. Ambient Temperature: Not exceeding 86 degrees F (30 degrees C) average or 104 degrees F (40 degrees C) maximum measured during any 24 hour period.
- C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

- D. Impregnate core and coil assembly with non-hygroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
- E. Basic Impulse Level: 10 kV.
- F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- G. Isolate core and coil from enclosure using vibration-absorbing mounts.
- H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.
- I. Sound Levels: Do not exceed NEMA ST 20 average sound levels

2.03 GENERAL PURPOSE TRANSFORMERS

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.
- B. Primary Voltage: 480 volts delta, 3 phase.
- C. Secondary Voltage: 208Y/120 volts, 3 phase.
- D. Insulation System and Allowable Average Winding Temperature Rise:
 - 1. 15 kVA and Larger: Class 220 degrees C insulation system with 115 degrees C average winding temperature rise.
- E. Coil Conductors: Continuous copper windings with terminations brazed or welded.
- F. Winding Taps:
 - 1. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
 - 2. 15 kVA through 300 kVA: Six 2-1/2 percent taps 2 above and 4 below rated high voltage.
 - 3. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.
- G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- H. Mounting Provisions:
 - 1. Less than 15 kVA: Suitable for wall mounting.
 - 2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
 - 3. Larger than 75 kVA: Suitable for floor mounting.
- I. Transformer Enclosure: Comply with NEMA ST 20.
 - 1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor clean, dry locations: Type 2.
 - b. Outdoor locations: Type 3R.
 - c. Indoor Electrical Rooms with sprinklers: Type 3R
 - 2. Construction: Steel.
 - a. 15 kVA and Larger: Ventilated.
 - 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
 - 4. Provide lifting eyes or brackets.
- J. Accessories:
 - 1. Mounting Brackets: Provide manufacturer's standard brackets.
 - 2. Weathershield Kits: Provide for ventilated transformers installed outdoors to provide a listed NEMA EN 10250, type 3R assembly.
 - 3. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

2.04 SOURCE QUALITY CONTROL

- A. Factory test transformers according to NEMA ST 20.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.

- B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.
- C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install transformers in accordance with NECA 409 and IEEE C57.94.
- D. Use flexible conduit, under the provisions of Section 260533.13, 2 feet (600 mm) minimum length, 3 feet maximum length for connections to transformer case. Make conduit connections to side panel of enclosure.
- E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.
- F. Install transformers plumb and level.
- G. Transformer Support:
 - 1. Provide required support and attachment in accordance with Section 260529, where not furnished by transformer manufacturer.
 - 2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
 - 3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.
 - 4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- H. Provide grounding and bonding in accordance with Section 260526.
- I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
- J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.
- K. Where furnished as a separate accessory, install transformer weathershield per manufacturer's instructions.
- L. Identify transformers in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS Sections 7.2.1.1 and 7.2.1.2. Tests and inspections listed as optional are not required.
 - 1. All Dry Type Transformers - Field Test
 - a. Perform turns ratio tests at all tap positions.
 - b. Perform insulation resistance test.
 - c. Perform grounding verification.
 - 2. All Dry Type Transformers - Factory Test
 - a. Load Loss
 - b. Impedance
 - c. Applied/Induced potential

3.04 ADJUSTING

- A. Measure primary and secondary voltages and make appropriate tap adjustments.

- B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from transformer components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262413.11
SWITCHBOARDS - SCHNEIDER ELECTRIC SQUARE D FLEXSET / QED-2

PART 1 GENERAL**1.01 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems
- C. Section 260553 - Identification for Electrical Systems
- D. Section 260573 - Power System Studies

1.02 ABBREVIATIONS AND ACRONYMS

- A. ERMS: Energy reduction maintenance setting.

1.03 DEFINITIONS

- A. Switchboards may also be identified as SWBD.

1.04 REFERENCE STANDARDS

- A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.
- B. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- C. ISO 9001 - Quality Management Systems — Requirements; 2015, with Amendment (2024).
- D. ISO 14001 - Environmental Management Systems — Requirements with Guidance for Use; 2015.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.
- G. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.
- H. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 1000 Volts or Less; 2023.
- I. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. NFPA 70B - Recommended Practice for Electrical Equipment Maintenance; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.
- M. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- N. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- O. UL 891 - Switchboards; Current Edition, Including All Revisions.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Provide sufficient information to determine compliance with Contract Documents. Identify submittal data with specific equipment tags and/or service descriptions to which they pertain. Identify specific model numbers, options, and features of equipment proposed.
- C. Indicate deviations from Contract Documents with reference to corresponding drawing or specification number and written justification for deviation.
- D. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, components, and accessories.

- E. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, instruments, features, and accessories.
 - 1. Include dimensioned plan and elevation views of switchboards; indicate dimensions, weights, shipping splits, and required clearances.
 - 2. Include single-line diagram.
- F. Operation and Maintenance Data:
 - 1. Provide detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
 - 2. Digital Record Keeping:
 - a. Provide maintenance logbook application/website available on PC/mobile device to assist in compliance with NFPA 70B.
 - b. Include access to manufacturer's standard documentation, equipment serial number, as-built drawings, assembly and testing results, device settings, and spare parts list.
 - c. Provide password-protected access to Owner.
 - d. Provide access via scannable QR code on front face of equipment.
- G. Executed warranty.
- H. Project Record Documents:
 - 1. Configured settings/parameters for adjustable components updated to as-installed and commissioned state, noted if different from factory default.

1.06 QUALITY ASSURANCE

- A. Comply with the following:
 - 1. NFPA 70.
 - 2. Requirements of local authorities having jurisdiction.
 - 3. Applicable local codes.
- B. Manufacturer Qualifications:
 - 1. Firm engaged in manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for minimum of 20 years.
 - 2. Certified in accordance with ISO 9001 with applicable quality assurance system regularly reviewed and audited by third-party registrar. Develop and control manufacturing, inspection, and testing procedures under guidelines of quality assurance system.
 - 3. Service, repair, and technical support services available 24 hours per day, 7 days per week from manufacturer or their representative.
 - 4. Certified in accordance with ISO 14001, with product environmental profiles (PEPs) for specified products.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Prior to delivery to project site, verify suitable storage space is available to store materials in well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres.
- B. Protect materials during delivery and storage and maintain within manufacturer's written storage requirements. At minimum, store indoors in clean, dry space with uniform temperature to prevent condensation and protect electronics from potential damage from electrical and magnetic energy.
- C. Deliver materials to project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified in Contract Documents.
- D. Inspect products and report concealed damage or violation of delivery, storage, and handling requirements to Engineer.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty for defects in material and workmanship for 12 months from date of commissioning or 18 months from date of shipment, whichever comes first. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Schneider Electric (Square D); QED-2
- B. ABB Inc. / GE Industrial Solutions
- C. Eaton Corporation
- D. Siemens Industry, Inc.
- E. Source Limitations: Furnish products produced by same manufacturer as other electrical distribution equipment for project and obtained from single supplier.

2.02 LOW-VOLTAGE SWITCHBOARDS

- A. Basis of Design: Schneider Electric; Square D QED-2 per project requirements;
- B. Switchboard Ratings/Configurations: As indicated on drawings.
- C. Switchboard Assemblies:
 - 1. Comply with NEMA PB 2; list and label as complying with UL 891.
 - 2. Provide front and rear alignment of adjacent sections.
- D. Short Circuit Current Rating: Provide SSCR greater than or equal to values determined by short-circuit/coordination study, but not less than 65 kAIC at 480V.
- E. Cable Terminations for Incoming Conductors:
 - 1. Provide lugs in quantity and size required for conductors indicated on drawings.
 - 2. Lug Type: Aluminum mechanical lugs, suitable for terminating aluminum or copper conductors unless otherwise indicated; rate for 167 degrees F (75 degrees C).
- F. Bussing:
 - 1. Bus Density Rating: Standard, in accordance with UL 891 temperature rise requirements.
 - 2. Bus Material: Hard-drawn, silver-plated copper of 98 percent conductivity unless otherwise indicated.
 - 3. Plating: Apply to bus surfaces except cut edges. Plating shall cover all bus surfaces except cut edges.
 - 4. Phase and Neutral Horizontal Bus: Ampacity equal to or greater than switchboard system rating. Tapered bus is not permitted.
 - 5. Group-Mounted Feeder Vertical Bus Stack:
 - a. Provide capability to mount feeder breakers with different frame sizes/poles across from one another on bus stack.
 - b. Design to remove nonconducting surface films during circuit breaker installation by wiping action of circuit breaker jaws.
 - c. Design in conjunction with circuit breaker jaws to create blow-on forces under fault conditions.
 - d. Bolted connections for group-mounted feeder breakers are not permitted.
 - 6. Ground Bus:
 - a. Size in accordance with NFPA 70 and UL 891.
 - b. Bus Material: Hard-drawn copper of 98 percent conductivity.
 - c. Equip with pressure connectors for feeder and branch circuit equipment grounding conductors.
- G. Enclosures:
 - 1. Construction: Steel.
 - 2. UL 50E Rating, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Indoor Locations with Fire Sprinkler Protection: Type 1 with drip hood.

- c. Outdoor Locations: Type 3R.
- 3. Front Covers: Removable with single tool.
- 4. Doors: Hinged with removable hinge pins.
- 5. Finish: Manufacturer's standard paint color over rust-inhibiting primer on treated metal surface.
- H. Future Provisions:
 - 1. Future Switchboard Sections: Equip horizontal bus with splicing hardware for additional switchboard sections.
 - 2. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit breaker compartment.
- I. Markings and Labeling:
 - 1. Provide identification and warning labels/nameplates exterior to equipment resistant to weather, UV, and intended installation environment.
 - 2. Provide warning labels/nameplates complying with ANSI Z535.4 at access locations to advise personnel of possible hazards in accordance with listing, NFPA 70, NFPA 70E, and other applicable standards. Labels shall be in alignment with NFPA 70E mandatory content (incident energy, PPE, boundaries, working distance).
 - 3. Provide scannable QR code on front face of equipment for access to maintenance logbook application/website available on PC/mobile device.
- J. Switchboards with Drawout Circuit Breakers: Provide overhead circuit breaker lifting device mounted at top front of switchboard.
- K. Maintenance Mode Switches:
 - 1. Description: Local, lockable switch with blue status indicator light that permits selection of maintenance mode with alternate electronic trip unit settings for reduced fault clearing time in accordance with NFPA 70.
 - 2. Provide for circuit breakers 1,200 A and larger and where indicated on drawings, unless providing other means of reducing clearing time in accordance with NFPA 70.
 - 3. Switch Type: Provide energy reduction maintenance settings (ERMS) switches or maintenance mode settings (MMS) switches as indicated.
 - a. ERMS Switches: Clearing time of less than 50 milliseconds when activated.
 - b. MMS Switches: Clearing time of less than 80 milliseconds when activated.
- L. Power Metering:
 - 1. Factory installed, integrated within switchboard.
 - 2. Applications:
 - a. Low-Voltage Mains: Power and energy meter.
 - 3. Power and Energy Meters:
 - a. Capable of monitoring for network management, energy cost allocation, asset management, operational efficiency, and compliance reporting.
 - b. Products:
 - 1) Schneider Electric PowerLogic PM5563 Meter.

2.03 OVERCURRENT PROTECTIVE DEVICES

- A. Circuit Breakers:
 - 1. Interrupting Capacity: As required to provide short circuit current rating indicated.
 - 2. Molded Case Circuit Breakers (MCCBs):
 - a. Comply with FS W-C-375; listed and labeled as complying with UL 489.
 - b. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 - c. Circuit Breaker Type:
 - 1) Provide thermal magnetic circuit breakers unless otherwise indicated.
 - d. Electronic Trip Units:
 - 1) Microprocessor based, with circuit breaker status display and LED trip indicators.
 - 2) Where indicated on drawings, provide electronic trip units with field-adjustable long-time and instantaneous protection settings.
 - e. Provide the following where indicated or required:

- 1) Shunt Trip: Provide 120 VAC coil, energized from separate circuit.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine equipment exterior and interior for damage, including but not limited to, structure, moisture, and mildew.
- B. Examine for conditions detrimental to completion of work, including:
 1. Verify concrete pads are level and free of irregularities.
 2. Verify installation space is enclosed and weatherproof.
 3. Verify wet work located in or in close proximity to switchboard installation location is completed and dry.
 4. Verify work above ceilings is complete.

3.02 INSTALLATION

- A. Install equipment in accordance with manufacturer's written instructions.
- B. Install switchboards in accordance with NECA 1, NECA 400, and NEMA PB 2.1.
- C. Unless otherwise indicated, install and anchor switchboards on 4-inch raised concrete pad.
- D. Set field-adjustable circuit breaker tripping function settings as determined by coordination study.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Manufacturer Services: Provide services of manufacturer's field representative to perform functional testing, commissioning, and first parameter adjusting.
 1. Include necessary material, equipment, labor, and technical supervision.
 2. Replace damaged or malfunctioning equipment and report discrepancies or installation issues.
 3. Identify switchboards with label indicating inspection/testing agency and date of service.
- C. Operational Readiness Testing:
 1. Inspect and test equipment and associated systems for conformance to Contract Documents, including equipment manufacturer's recommendations, and readiness for operation.
 - a. Visually inspect for physical damage and proper installation.
 - b. Perform tests in accordance with manufacturer's instructions.
 - c. Perform tests to verify compliance with Contract Documents.
 - d. Perform tests to verify equipment is ready for operation.
 - e. Touch-up paint chips and scratches with manufacturer-supplied paint.
 - f. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
 - g. Measure, using high potential testing, insulation resistance of each bus structure phase-to-phase and phase-to-ground for one minute each, at minimum test voltage of 1,000 VDC.
 - 1) Comply with manufacturer's documented specific testing procedures.
 - 2) Minimum Insulation Resistance: 1 megohm.
 - h. Physically test key interlock systems for proper functionality prior to energizing.
 - i. Test continuity of each circuit.
 - j. Perform each electrical test and visual/mechanical inspection listed in NETA ATS as applicable. Certify compliance with test parameters.
 - 1) Switchboards: See Section 7.1.
 - 2) Fusible Switches: See Section 7.5.
 - 3) Circuit Breakers: See Section 7.6.
 - 4) Relays: See Section 7.9.
 - 5) Instrument Transformers: See Section 7.10.
 - 6) Meters: See Section 7.11.
 - 7) Ground Fault Protection Systems: See Section 7.14.
- D. Correct deficiencies and replace damaged or defective switchboards or associated components.

3.04 PROTECTION

- A. Protect installed switchboards from subsequent construction operations.

3.05 MAINTENANCE

- A. See Section 260160.13 for additional information.

END OF SECTION

**SECTION 262416
PANELBOARDS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- F. Section 262200 - Low-Voltage Transformers: Small power centers with integral primary breaker, transformer, and panelboard.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- E. NEMA PB 1 - Panelboards; 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.
- G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 67 - Panelboards; Current Edition, Including All Revisions.
- J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- K. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.
- L. UL 1699 - Arc-Fault Circuit-Interruption; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
 1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
 2. Include wiring diagrams showing all factory and field connections.
 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 4. Include documentation of listed series ratings upon request.
 5. Coordinate Fault Current ratings with Study.
- C. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.
- D. Field Quality Control Test Reports.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. Panelboard Keys: Two of each different key.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. ABB Inc. / General Industrial Solutions
- B. Eaton Corporation
- C. Schneider Electric (Square D)
- D. Siemens Industry, Inc.
- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
- C. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
 - 2. Listed series ratings are not acceptable.
- D. Main Breaker: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Mounted Main Circuit Breakers are not allowed.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Cabinets shall be of such size as to allow a wiring gutter space of at least 6" all around for power panels, and 4" all around for lighting panels.
 - b. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
 - 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
 - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
- L. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

- M. Each Panelboard shall be complete with main tin plated copper bus run up the center and neutral bars where required and all proper sequence phase connections. Polarized panelboards will not be accepted. Capacities of copper busses and connections shall be based on a maximum density of 1000 amps per sq. in. spacing of busses shall not be less than code requirements.
- N. Busses shall be arranged as indicated on the drawings. Busses shall be provided with suitable phase identification.
- O. Directory holder with metal frame shall be furnished and installed upon the door of each cabinet, with complete typewritten circuit schedule inserted.
- P. The inside and outside of panelboard boxes, doors and trims shall be furnished with at least two coats of manufacturer's standard finish paint over a baked-on prime coat.
- Q. Provide ground bus. Provide additional isolated ground bus where specified.
- R. Lighting and Appliance Panels: Panels shall be for use on voltage phase, number of wire system, 60 cycle, solid neutral service, with number and size of bolt-on type circuit breaker branches as shown on the drawings. Circuit breaker's interrupting capacity shall be 10,000 RMS symmetrical amperes unless otherwise noted.
- S. Power and Distribution Panels:
 - 1. Power and distribution panels shall be the dead-front type, with hinged doors, with fusible circuit breakers in the branches as indicated on the drawings. The panels shall be suitable for 208/120 volt, 3-Phase, 4-wire or 480/277 volt, 3-phase, 4-wire supply as shown.

2.03 POWER DISTRIBUTION PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Copper suitable for terminating copper conductors only.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase and Neutral Bus Material: Copper.
 - 2. Ground Bus Material: Copper.
- D. Circuit Breakers:
 - 1. Provide bolt-on type.
 - 2. Provide thermal magnetic circuit breakers unless otherwise indicated.
 - 3. Provide electronic trip circuit breakers where indicated.
- E. Enclosures:
 - 1. Provide surface-mounted enclosures unless otherwise indicated.
 - 2. NEMA 1 Indoors, NEMA 3R outdoors.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Copper suitable for terminating copper conductors only.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 - 2. Phase and Neutral Bus Material: Copper.
 - 3. Ground Bus Material: Copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:

1. Provide surface-mounted enclosures as indicated.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) Match results of the Electrical Load Study, 22 kAIC minimum rms symmetrical amperes at 240 VAC or 208 VAC.
 - 2) Match results of Electrical Load Study, 22 kAIC minimum rms symmetrical amperes at 480 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Provide compression lugs where indicated.
 - c. Lug Material: Copper suitable for terminating copper conductors only.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Provide the following circuit breaker types where indicated on the drawings:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
 - c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
 - d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
 - e. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
8. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.
9. Do not use tandem circuit breakers.
10. Do not use handle ties in lieu of multi-pole circuit breakers.
11. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
12. Provide the following features and accessories where indicated or where required to complete installation:
 - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.06 SOURCE QUALITY CONTROL

- A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.

- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Secure all panelboards to building structure/walls to comply with tightening torques specified to UL Standards 486A-B.
- E. Panelboard loads shall be balanced between phases.
- F. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- G. Install panelboards plumb.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- I. Mount floor-mounted power distribution panelboards on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.
- J. Provide grounding and bonding in accordance with Section 260526.
 - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
- K. Install all field-installed branch devices, components, and accessories.
- L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- M. Set field-adjustable circuit breaker tripping function settings per load study.
- N. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- O. Provide filler plates to cover unused spaces in panelboards.
- P. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads for the following:
 - 1. Fire detection and alarm circuits.
 - 2. Communications equipment circuits.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
- D. Test GFCI circuit breakers to verify proper operation.
- E. Test AFCI circuit breakers to verify proper operation.
- F. Test shunt trips to verify proper operation.
- G. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.
- H. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

**SECTION 262726
WIRING DEVICES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Wall switches.
- B. Receptacles.
- C. Wall plates.
- D. Floor box service fittings.
- E. Access floor boxes.

1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section {id\#874} - Boxes for Electrical Systems.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- L. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
 - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
 - 5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
 - 6. Notify Engineer/Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- B. Field Quality Control Test Reports.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Operation and Maintenance Data:
 1. GFCI Receptacles: Include information on status indicators.
- E. Project Record Documents: Record actual installed locations of wiring devices.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Products: Listed, classified, and labeled as suitable for the purpose intended.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 GENERAL

- A. Provide factory-fabricated wiring devices, in types, colors, and electrical ratings for applications indicated and complying with NEMA Standards, Publication WD or as required. Unless otherwise noted device cover plates shall be stainless steel.

2.02 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with 20 ampere rating minimum and not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide GFCI receptacles installed within 6 feet (1.8 m) of sinks.
- E. Provide GFCI receptacles installed in kitchens.
- F. Provide GFCI protection for all receptacles serving electric drinking fountains. Use GFCI Breaker for GFCI protection due to accessibility issues with receptacle.
- G. Unless noted otherwise, do not use combination switch/receptacle devices.
- H. For flush floor service fittings, use tile rings for installations in tile floors.
- I. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.03 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices Installed in Finished Spaces: White with stainless steel wall plate.
- C. Wiring Devices Installed in Unfinished Spaces: White with stainless steel wall plate.
- D. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

2.04 WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell Incorporated
 - 2. Leviton Manufacturing Company, Inc
 - 3. Pass & Seymour, a brand of Legrand North America, Inc
 - 4. Lutron
- B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20and where applicable FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.05 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell Incorporated
 - 2. Leviton Manufacturing Company, Inc
 - 3. Lutron Electronics Company, Inc; Designer Style
 - 4. Pass & Seymour, a brand of Legrand North America, Inc
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498and where applicable FS W-C-596; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 - 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
 - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 - 2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
 - 3. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
- D. GFCI Receptacles:
 - 1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
 - a. Provide test and reset buttons of same color as device.
 - 2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
 - 3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
- E. USB Charging Devices:
 - 1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
 - a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
 - 2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

2.06 WALL PLATES

- A. Manufacturers:
 - 1. Hubbell Incorporated
 - 2. Leviton Manufacturing Company, Inc
 - 3. Lutron Electronics Company, Inc
 - 4. Pass & Seymour, a brand of Legrand North America, Inc
- B. Wall Plates: Comply with UL 514D.
 - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 - 2. Size: Standard; oversized where required..
 - 3. Screws: Metal with tamper-resistant heads finished to match wall plate finish.
- C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- D. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- E. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.
- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switches: 48 inches (1200 mm) above finished floor.
 - b. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
 - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 - 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 - 4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Engineer/Architect to obtain direction prior to proceeding with work.
 - 5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.

- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- N. Identify wiring devices in accordance with Section 260553.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Prior to energizing circuitry, test wiring devices for electrical continuity and proper polarity connections. After energizing circuitry, test wiring devices to demonstrate compliance with requirements.
- C. Inspect each wiring device for damage and defects.
- D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- E. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 265100
INTERIOR LIGHTING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.
- E. Lamps.
- F. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 260529 - Hangers and Supports for Electrical Systems.
- B. Section 260533.16 - Boxes for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 262726 - Wiring Devices: Manual wall switches and wall dimmers.
- E. Section 265600 - Exterior Lighting.

1.03 REFERENCE STANDARDS

- A. ANSI C82.4 - American National Standard for Lamp Ballasts - Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps; 2017, with Editorial Revision (2022).
- B. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts; 2023.
- C. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.
- D. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.
- E. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- G. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2025.
- H. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- I. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
- M. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- N. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.
- O. UL 1029 - High-Intensity-Discharge Lamp Ballasts; Current Edition, Including All Revisions.
- P. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- Q. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Engineer/Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. Shop Drawings:
 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 2. Provide photometric calculations where luminaires are proposed for substitution 10 days prior to bid date for Engineer Approval.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - b. Include IES LM-79 test report upon request.
 2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
 3. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
- C. Field quality control reports.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 016000 - Product Requirements, for additional provisions.
 2. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

PART 2 PRODUCTS**2.01 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
 - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
 - 3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
- H. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- I. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.03 EMERGENCY LIGHTING UNITS

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C. Battery:
 - 1. Sealed maintenance-free Lithium-ion unless otherwise indicated.
 - 2. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.
- F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.
- G. Accessories:
 - 1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
 - 2. Provide compatible accessory high impact polycarbonate vandal shields where indicated.
 - 3. Provide compatible accessory wire guards where indicated.

4. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.04 EXIT SIGNS

- A. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
 1. Number of Faces: Single or double as indicated or as required for the installed location.
 2. Directional Arrows: As indicated or as required for the installed location.

2.05 BALLASTS AND DRIVERS

- A. Ballasts/Drivers - General Requirements:
 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

2.06 LAMPS

- A. Lamps - General Requirements:
 1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
 2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
 3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
 4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Engineer/Architect to be inconsistent in perceived color temperature.

2.07 ACCESSORIES

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.
- C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.
- D. Fire-Rated Luminaire Enclosures:
 1. Provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

- D. Provide required support and attachment in accordance with Section 260529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Furnish and set all inserts, anchors, studs, and hangers for the support of lighting fixtures and respective equipment, and make all necessary adjustments as required.
- G. In acoustical tile ceiling with concealed mechanical suspension system and in gypboard or plaster ceilings, recessed troffers shall be flanged type fixtures. In acoustical tile ceilings with exposed mechanical suspension systems, troffers shall be lay-in type.
- H. For any type ceiling provide sufficient support for fixtures, either arrange with other subcontractors to strengthen ceiling or support fixtures from structure above independently of ceiling. Regardless of whether or not the ceiling can support the fixtures, provide securing wiring on fixture to structure. Provide a minimum of two securing wires to 2x4, 2x2, etc. NOTE: Securing wires are not the same as support wires. Securing wires are for preventing a fixture from falling into a space if the ceiling fails under a fire situation.
- I. All lay-in fixtures shall be connected to grid system with hurricane clips.
- J. Fixtures to be installed in or on painted ceilings and/or walls shall not be installed until painting is completed. Fixtures installed with paint applied over factory finishes will be rejected.
- K. Suspended Ceiling Mounted Luminaires:
 - 1. Do not use ceiling tiles to bear weight of luminaires.
 - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 - 3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
 - 4. Secure pendant-mounted luminaires to building structure.
 - 5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 - 6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
- L. Recessed Luminaires:
 - 1. Install trims tight to mounting surface with no visible light leakage.
 - 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
 - 3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- M. Suspended Luminaires:
 - 1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
 - 2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
 - 3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet (1.2 m) between supports.
 - 4. Install canopies tight to mounting surface.
 - 5. Unless otherwise indicated, support pendants from swivel hangers.
- N. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- O. Install accessories furnished with each luminaire.
- P. Bond products and metal accessories to branch circuit equipment grounding conductor.
- Q. Emergency Lighting Units:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- R. Exit Signs:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

- S. Install lamps in each luminaire.
- T. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

3.04 FIELD QUALITY CONTROL

- A. Inspect each product for damage and defects.
- B. Operate each luminaire after installation and connection to verify proper operation.
- C. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer/Architect.

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer/Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Engineer/Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Engineer/Architect or authority having jurisdiction.

3.06 CLEANING

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of luminaires to Engineer/Architect, and correct deficiencies or make adjustments as directed.
- B. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 265600
EXTERIOR LIGHTING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Exterior luminaires.
- B. Poles and accessories.
- C. Luminaire accessories.

1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section 265100 - Interior Lighting.

1.03 REFERENCE STANDARDS

- A. NECA/IESNA 501-2013 (latest reaffirmation)
- B. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- C. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.
- D. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.
- E. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
 - 2. Notify Engineer/Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
 - 3. Coordinate pole selection, hand hole size, and pole wiring provisions with security cameras, intercom speakers, and any other pole mounted equipment. Provide separate conduits and wiring spaces as required to maintain system integrity and serviceability.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.

- b. Include IES LM-79 test report for proposed substitutions.
- 2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
- 3. Lamps: Include rated life and initial and mean lumen output.
- C. Field Quality Control Reports.
 - 1. Include test report indicating measured illumination levels.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide 10 year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including drivers, reflectors, lenses, housings and other components required to position, energize and protect the LED module and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
- H. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
 - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
 - 3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
- I. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 100,000 hours at 90 % lumen maintenance, calculated based on IES LM-80 test data.

- J. Exposed Hardware: Stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires in accordance with NECA/IESNA 501.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- G. Pole-Mounted Luminaires:
 - 1. Foundation-Mounted Poles:
 - a. Install foundations plumb.
 - b. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
 - c. Tighten anchor bolt nuts to manufacturer's recommended torque.
 - d. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage (weep hole).
 - 2. Grounding:
 - a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
 - 3. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
- H. Install accessories furnished with each luminaire.
- I. Bond products and metal accessories to branch circuit equipment grounding conductor.
- J. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy drivers as determined by Engineer/Architect.

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer/Architect. Secure locking fittings in place.

- B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Engineer/Architect.

3.06 CLEANING

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.
- B. See Section 017900 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of luminaires to Engineer/Architect, and correct deficiencies or make adjustments as directed.
- D. Just prior to Substantial Completion, replace all failed LED modules or drivers..

3.08 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

**SECTION 271000
STRUCTURED CABLING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Communications system design requirements.
- B. Communications pathways.
- C. Copper cable and terminations.
- D. Fiber optic cable and interconnecting devices.
- E. Communications equipment room fittings.
- F. Communications outlets.
- G. Communications grounding and bonding.
- H. Communications identification.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260533.13 - Conduit for Electrical Systems.
- D. Section 260533.16 - Boxes for Electrical Systems.
- E. Section 260553 - Identification for Electrical Systems: Identification products.
- F. Section 262726 - Wiring Devices.

1.03 REFERENCE STANDARDS

- A. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.
- B. ICEA S-83-596 - Indoor Optical Cable; 2021.
- C. NECA/BICSI 568 - Standard for Installing Commercial Building Telecommunications Cabling; 2006.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 1988a (Reaffirmed 2012).
- F. TIA-492AAAD - Detail Specification for 850-nm Laser- Optimized, 50-µm Core Diameter/125-µm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers Suitable for Manufacturing OM4 Cabled Optical Fiber; 2009.
- G. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; IEC 61280-4.1 Edition 3.1, Fiber Optic Communications Subsystem Test Procedures- Part 4-1: Installed Cable Plant- Multimode Attenuation Measurement; 2023d.
- H. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2024.
- I. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).
- J. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2022e.
- K. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).
- L. TIA-598 - Optical Fiber Cable Color Coding; 2014d, with Addendum (2018).
- M. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.
- N. TIA-607 - Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2024e.
- O. UL 444 - Communications Cables; Current Edition, Including All Revisions.
- P. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

Q. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.

R. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider. Pay for all utility work.
 - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
 - 3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Arrange for Communications Service Provider to provide service.
- C. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Communications Service Provider representative.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- B. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
- C. Evidence of qualifications for installer.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
- E. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.
- F. Field Test Reports.
- G. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
 - 1. Record actual locations of outlet boxes and distribution frames.
 - 2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
 - 3. Identify distribution frames and equipment rooms by room number on drawings.
- H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.06 QUALITY ASSURANCE

- A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.
- C. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
 - 1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
 - 2. Supervisors and installers factory certified by manufacturers of products to be installed.
 - 3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.
- D. Products: Listed, classified, and labeled as suitable for the purpose intended.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

- B. Keep stored products clean and dry.

1.08 WARRANTY

- A. Correct defective Work within a 5 year period after Date of Substantial Completion.
- B. Manufacturer warranty of 20 years on all equipment.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

- A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
 - 1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
 - 2. Comply with Communications Service Provider requirements.
 - 3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
 - 4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
- B. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
 - 1. Locate main distribution frame as indicated on the drawings.
 - 2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.
- C. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
 - 1. Locate intermediate distribution frames as indicated on the drawings.
- D. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.
- E. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.02 PATHWAYS

- A. Conduit: As specified in Section 260533.13; provide pull cords in all conduit.
- B. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

2.03 COPPER CABLE AND TERMINATIONS

- A. Copper Horizontal Cable:
 - 1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
 - 2. Cable Type - Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
 - 3. Cable Capacity: 4-pair.
 - 4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
 - 5. Cable Applications:
 - a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
 - b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.
- B. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.
- C. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
 - 1. Performance: 500 mating cycles.
 - 2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

2.04 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

- A. Fiber Optic Backbone Cable:
 - 1. New Fiber Optic Backbone Cable:
 - a. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
 - b. Cable Type: Multimode, laser-optimized 50/125 um (OM4) complying with TIA-492AAAD.
 - c. Cable Capacity: 24-fiber.
- B. Fiber Optic Interconnecting Devices:
 - 1. Connector Type: Type LC, duplex connectors, compliant with TIA-568.3
 - 2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
 - 3. Maximum Attenuation/Insertion Loss: 0.3 dB.

2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

- A. Copper Cross-Connection Equipment:
 - 1. Patch Panels
 - a. Provide rack-mounted patch panels to terminate all horizontal copper cabling.
 - b. Panels shall be factory manufactured, modular type, with front-access jacks and rear termination blocks.
 - c. Panels shall be available in standard 48-port per 2U configuration or high-density configurations up to 96-ports per 1U, provided that:
 - 1) Each port is individually labeled and corresponds to TIA-606 structured cabling identification requirements.
 - 2) Terminations are IDC type, compatible with 110 punch-down tools.
 - 3) Panels maintain Category 6 performance for NEXT, FEXT, and return loss as defined by ANSI/TIA-568.2-D.
 - (a) Panels shall include rear cable management bars and front label fields with clear label covers.
 - (b) Acceptable manufacturers: Panduit, Leviton, Hubbell, Ortronics, Siemon, or approved equal.
- B. Fiber Optic Cross-Connection Equipment:
 - 1. Provide rack-mounted fiber distribution panels with front and rear access, designed for modular adapter plates or cassettes.
 - 2. All connectors shall be LC duplex type. SC and ST connectors are not permitted.
 - 3. Enclosures shall be sized to accommodate at least 24-fiber termination per rack unit, expandable to a minimum of 96 fibers per 4U rack space.
 - 4. Provide protective dust caps for all unused ports.
 - 5. Enclosures shall include integrated splice trays, strain relief, and cable management.
 - 6. Provide labeling fields in compliance with TIA-606, with permanent machine-printed labels for each port.
 - 7. Acceptable manufacturers: Panduit, Leviton, Hubbell, Corning, Siemon, or approved equal.
- C. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.
 - 1. Size: As indicated on drawings.
 - 2. Do not paint over UL label.
- D. Equipment Frames, Racks and Cabinets:
 - 1. Component Racks: EIA/ECA-310 standard 19 inch (482.6 mm) wide.
 - 2. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
- E. Cable Management:
 - 1. Manufacturers:
 - a. CommScope; _____: www.commscope.com/#sle.
 - 2. Product(s):
 - a. CommScope Cable Runway: www.commscope.com/#sle.

- b. CommScope Horizontal/Vertical Cable Managers; HCM-SS-XX-XX/VCM-DS-XX-XX Series: www.commscope.com/#sle.
- c. CommScope FiberGuide Raceway: www.commscope.com/#sle.

2.06 COMMUNICATIONS OUTLETS

- A. Outlet Boxes: Comply with Section 260533.16.
 - 1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
- B. Wall Plates:
 - 1. Comply with system design standards and UL 514C.
 - 2. Accepts modular jacks/inserts.
 - 3. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 262726.

2.07 GROUNDING AND BONDING COMPONENTS

- A. Comply with TIA-607.
- B. Comply with Section 260526.
- C. Provide Telecommunications Main Grounding Busbar (TMGB) in MDF and Telecommunications Grounding Busbar (TGB) in all IDF's, bonded with #6 AWG copper minimum.

2.08 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606.
- B. Comply with Section 260553.

2.09 SOURCE QUALITY CONTROL

- A. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), NECA/BICSI 568, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
- B. Comply with Communication Service Provider requirements.
- C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.
- D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

3.02 INSTALLATION OF PATHWAYS

- A. Install pathways with the following minimum clearances:
 - 1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
 - 2. 12 inches (300 mm) from power conduits and cables and panelboards.
 - 3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
 - 4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.
- B. Conduit, in Addition to Requirements of Section 260533.13:
 - 1. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between pull points.
 - 2. Conduit Bends: Inside radius not less than 10 times conduit internal diameter.
 - 3. Arrange conduit to provide no more than 100 feet (30 m) between pull points.
 - 4. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.
 - 5. Conduits, sleeves, raceways, trays, and cable supports shall be sized to maintain a maximum initial fill of 40 percent at installation. Pathways shall include minimum of 25 percent spare capacity for future growth and be designed to allow additional pathways where future expansion is anticipated.

Under no circumstance shall pathway fill exceed 60 percent of the cross-sectional area in accordance with ANSI/TIA-569-E and NEC Chapter 9, Tables 1 and C.

C. Outlet Boxes:

1. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of telecommunications outlets provided under this section.
 - a. Mounting Heights: Unless otherwise indicated, as follows:
 - 1) Telephone and Data Outlets: 18 inches (450 mm) above finished floor.
 - b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 - c. Provide minimum of 24 inches (600 mm) horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
 - d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
 - e. Locate outlet boxes so that wall plate does not span different building finishes.
 - f. Locate outlet boxes so that wall plate does not cross masonry joints.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:

1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
2. Do not over-cinch or crush cables.
3. Do not exceed manufacturer's recommended cable pull tension.
4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:

1. At Distribution Frames: 180 inches (____ mm).
2. At Outlets - Copper: 36 inches (____ mm).

C. Copper Cabling:

1. Category 6 and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
3. Use T568B wiring configuration.

D. Fiber Optic Cabling:

1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
2. Support vertical cable at intervals as recommended by manufacturer.

E. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

F. Identification:

1. Use wire and cable markers to identify cables at each end.
2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

A. Comply with inspection and testing requirements of specified installation standards.

B. Visual Inspection:

1. Inspect cable jackets for certification markings.
2. Inspect cable terminations for color coded labels of proper type.
3. Inspect outlet plates and patch panels for complete labels.

C. Testing - Copper Cabling and Associated Equipment:

1. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.

2. Test operation of shorting bars in connection blocks.
 3. Category 6 and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.
 4. Category 6 and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.
- D. Testing - Fiber Optic Cabling:
1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
 2. Multimode Backbone: Perform tests in accordance with TIA-526-14.
- E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 282300
SECURITY ELECTRONICS GENERAL**PART 1 – GENERAL****1.01 SUMMARY**

- A. The work covered by this Section of the Specifications shall include all labor, equipment, materials and services to furnish and install, calibrate, adjust, document, and test the total system as required herein and on the drawings. All materials and labor specified under this Specification Section and all other security electronic sub-sections shall be new and shall be furnished by a single pre-qualified Electronic Security System Contractor (ESSC), who shall assume responsibility for engineering, detailing, coordinating, supplying, installing, programming, performance and warranty of this work, in accordance with the contract documents.
- B. This project consists of an integrated security control system and incorporates the Locking control system, Intercommunication system, IP based CCTV System, Lighting and utility control system, Inmate Water valve control, Equipment Racks and Enclosures, UPS system(s) and other appurtenances necessary to the delivery of a complete system. All products shall be as specified in the contract documents. The scope of work includes engineering, providing, installing, documenting, programming, demonstration testing, start-up, and final field testing, of all aspects of the system as well as training of Owner personnel in the use of new Electronic Security System equipment.
- C. If a conflict or discrepancy is found in the contract documents, it shall be brought to the Electrical Engineer for review and resolution.
- D. ESSC Shall coordinate with the Millwork provider for control room millwork requirements including screen positioning, grommet locations, access to power, access to compartments for workstations and UPS systems and access panels.
- E. ESSC Shall furnish and install all wire and cabling necessary for a complete and total system.
- F. The ESSC Shall configure, optimize and tune the new intercom system to provide clear, static-free two way audio between operator stations and field devices.
- G. All equipment shall be new and shall be provided and installed in accordance with the contract documents and approved submittals.
- H. At project closeout, the ESSC shall turn over all project related passwords, source code and programming schedules. Prior to final payment, all software shall be authenticated as being non-proprietary by the Owner or Owner's designated representative.
- I. The system shall allow fully granular control assignment at each touch screen location. The system shall be configured to provide automatic CCTV camera call-up upon intercom selection, either when an operator answers a call or when the operator initiates the call.
- J. The system shall record and archive all system activities in a Security Management System (SMS) database that is searchable by user selectable parameters. Only authorized personnel shall have access to SMS data.
- K. All interconnections between systems shall be data connections or discrete I/O and shall be coordinated by the touch screen system / PLC programmable logic. All operations shall be as herein described and as shown on the drawings.

1.02 SCOPE RESPONSIBILITY AND COORDINATION

- A. The ESSC's scope of work and project responsibility consists of the total content of any and all portions of the plans and specifications for division 28 23 00 systems. The ESSC's scope of work includes but is not necessarily limited to the following:
 - 1. 28 23 00 Security Electronics General
 - 2. 28 23 10 PLC and Relay Control system
 - 3. 28 23 20 Touch Screen Control system
 - 4. 28 23 30 Intercommunication System
 - 5. 28 23 40 Video Management System
 - 6. 28 23 50 Access Control System

7. 28 23 80 Equipment Racks and UPS Systems

- B. The ESSC shall bid directly to the Electrical Contractor (EC).
- C. The ESSC shall coordinate with and through the Electrical Contractor.
- D. The ESSC shall be responsible for coordinating with Division 8, Division 11, and Division 26 for the power and cabling requirements of all electric strikes, electro-mechanical locks, door position indicators, or any other device associated with and controlled/monitored by the Electronic Security System.
- E. The Division 26 contractor shall provide all conduit, raceway, standard boxes and fittings, pull strings, equipment grounding, and power requirements. The ESSC shall be responsible for providing, installing and terminating all low voltage cabling. The ESSC shall be responsible for all Division 28 field device installation, terminations, and equipment configuration.
- F. The ESSC shall provide all specialty backboxes and enclosures to the Division 26 Contractor and the Division 26 contractor shall install specialty backboxes and enclosures and provide the required raceway.
- G. The ESSC shall provide a complete, fully functional, integrated Electronic Security System. This shall include all requirements for proper control and monitoring of electrically controlled builders hardware as well as electrically controlled detention door hardware. Coordinate all architectural doors with security devices to ensure proper lock, lock power, and control wiring to these locations.
- H. The ESSC shall coordinate with the Division 26 contractor for integration to the lighting relay panel for lighting, television, and other utility and power-related circuits in the detention area.
- I. The Electrical Contractor shall furnish and install the lighting relay control panel(s) and make all high voltage connections. The ESSC shall furnish and install the necessary components for integration.
- J. The ESSC shall be responsible for coordinating with Division 22, to integrate the Touch screen / PLC Control system with the inmate water valves for on/off control.
- K. The Division 26 Contractor shall furnish and install a #6 AWG ground wire, from the grounding lug in the equipment rack(s) / cabinet(s) to the building ground system. The ESSC shall coordinate with the Electrical contractor as to the quantity and location of such enclosures requiring grounding.
- L. All Cable for detention door locks and other devices in the detention (Jail) area of the facility shall be concealed within raceway from the device to the head end equipment rack or cabinet. This includes intercoms, cameras, card readers etc.
- M. Cabling for security devices not located in the detention (Jail) area of the facility may be stubbed out above the finished ceiling and routed in J-Hooks or cable tray.
- N. The ESSC shall provide an early submittal package for conduit coordination. This submittal will include requirements for conduit fill, raceway, and power. Specifically, it shall include conduit fill schedules, wire/cable sizes and quantities, system wiring requirements, load calculations, rack/panel, and control equipment locations and elevations for the electronic security system. The minimum size for conduits for all Division 28 systems shall be ¾" unless otherwise specified.
- O. The ESSC shall furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a complete and operating system.
- P. The ESSC shall provide all necessary DC system power, unless otherwise noted. Division 8 contractor shall provide any special power supplies required for electrified hardware provided under Division 8 specifications.
- Q. The ESSC shall turn over to the Owner all system documentation including termination point and interconnection schedules, all configuration files, and programming source code including Touch Screen software, PLC development software, VMS software, VMS viewing software, video system software and applicable licenses required for operations. This is to also include the touchscreen and security management system licenses.
- R. At project closeout, after final testing and acceptance, the ESSC shall Export configuration file Backups for all system components including Network configuration, Access Control configuration, Video Management System configuration, Touch screen (HMI) Configuration, PLC Configuration and any other related system. These backup configuration files shall be retained by the ESSC and also turned over to the owner on a USB Drive along with the spare parts.

- S. The ESSC shall provide flat Touchscreen Control Consoles to integrate the controlling and monitoring of all doors, alarms, video, intercoms, and other designated devices and annunciations.
- T. The ESSC shall provide a hi resolution, IP based color video system with network video recording allowing for 90 (Ninety days) of retention for recorded video.
- U. The ESSC shall include five (5) years of software maintenance for the Video Management System including all available upgrades, patches, new releases or versions to the owner as a part of the base bid.
- V. The IP video system shall include all necessary software components, modules and licenses necessary to meet the requirements of the contract documents.
- W. Provide cabling from head-end to field devices for the IP Video system. All cabling shall be tested and certified prior to installation of cameras. Test results for both Fiber Optic and Copper cable shall be provided to the Electrical Engineer for review prior to the installation of cameras. See section 28 23 40 for additional requirements.
- X. The ESSC shall provide Video Viewing Workstation software and licenses as required.
- Y. The ESSC shall provide all required cameras, lens, and housings, brackets, arms and mounts for interior and exterior application as shown on the contract documents or required to meet the design intent.
- Z. The ESSC shall provide a Security System remote access interface with cabling and connection to an owner provided internet connection for remote warranty troubleshooting support and maintenance.
- AA. The ESSC shall provide an Intercommunications system as described in the contract documents.
- BB. The ESSC Shall ensure that all portions of all division 28 security systems are connected to UPS Backup power with a tested run-time of at least 20 minutes at the actual load.
- CC. The ESSC shall coordinate and provide either dry contact relay interface or data interface at the Electronic Security System head end equipment for Inmate area lighting control, Inmate television power control and Inmate water valve shutoff via touchscreen control as described in the contract documents.
- DD. The ESSC shall provide touchscreen control and control relay interface for Entrance Vehicle gate and the Vehicle Sally port Overhead Door Control; coordinate with motor operator provider (Gate Operators and roll up doors not provided by ESSC).
- EE. The ESSC shall provide all spare components as specified in each Division 28 Subsection.

1.03 RELATED SECTIONS

- A. Related work in other divisions that require close coordination with this division.
 - 1. DIVISION 1 – GENERAL REQUIREMENTS
 - 2. DIVISION 3 – CONCRETE
 - 3. DIVISION 8 – DOORS AND WINDOWS
 - 4. DIVISION 11 – EQUIPMENT
 - 5. DIVISION 22 - PLUMBING
 - 6. DIVISION 26 & 27 – ELECTRICAL

1.04 CONTRACT DRAWINGS

- A. The Drawings indicate the arrangement of security and communication equipment. Review architectural Drawings for door swings, cabinets, counters, and built-in equipment; conditions indicated on architectural Drawings shall govern for this work. Coordinate the installation of equipment with the structural, mechanical and electrical equipment and access thereto. Coordinate installation of recessed equipment with concealed ductwork and piping and wall thickness. Do not scale security Drawings.
- B. Device locations are approximate. Actual device locations shall be field coordinated with all other trades and applicable code requirements. Location of all components of the locking control systems, cameras, intercom stations, paging speakers, card readers, etc. indicated on the contract drawings is approximate unless specified dimensions are shown. Components and field devices shall be field located for proper use of the device with consideration given to other equipment (i.e. light fixtures, HVAC diffusers, sprinkler heads, etc.) installed in the immediate vicinity.

1.05 QUALITY ASSURANCE

- A. All equipment provided under this section shall be new and shall be the standard product of the manufacturers listed herein or listed in a pre-bid addendum.
- B. It is a requirement of these specifications that the Division 28 systems be provided and installed by a qualified Electronic Security Systems Contractor (ESSC) whose normal business is the provision and installation of electronic security and communications systems and equipment of a similar type and function as those specified herein.
- C. Any ESSC wishing to submit a bid for this portion of the specifications must be pre-qualified and listed herein or in a pre-bid addendum.
- D. The following ESSC's have been pre-qualified to provide and install the work described herein:
 - 1. Accurate Controls – Ripon, WI
 - 2. B&E Communications – Jackson, MS
 - 3. CML Security - Erie, CO
 - 4. Cornerstone Electronics – Montgomery, AL
 - 5. Icotech, Inc. – Montgomery, AL
 - 6. Sustainable Security Solutions (S3) – San Antonio, TX
- E. It is not the intent of the Owner or Architect to unfairly restrict competition. Other equally competent ESSCs who meet the qualification criteria specified herein shall be added to the list of approved Electronic Security System Contractors (ESSC) by addendum. Verbal approval will not satisfy this requirement. Grounds for disqualification shall exist if, in the opinion of the Architect, the information submitted is inaccurate or does not comply with the requirements of this specification. All competent non-listed ESSCs may request to be listed by submitting the data requested in the paragraph 'Qualification Criteria for the ESSC', a minimum of fifteen (15) days prior to the original bid receipt date.
- F. Qualification Criteria for approval of unlisted ESSC:
 - 1. The owners and principals of the ESSC shall have been actively engaged in the design, manufacture and delivery of Electronic Security system solutions in the corrections market. Provide a historical narrative of the company and its key employees from inception, including history of ownership, partnership, incorporation and/or other relevant organizational information.
 - 2. Provide documentation of experience. List five (5) project references of similar size and scope. References must include project names, addresses, description of systems, and the names, addresses, telephone numbers, and contact person of the contractor and/or Owner for whom the work was done.
 - 3. Provide statement that principals, owners and key employees have a minimum of ten continuous years of experience furnishing and installing Electronic Security Systems of similar size and scope.
 - 4. Provide a resume of all key employees in supervisory positions; include their current position, time of service in current position, years as a full-time employee of the ESSC, and number of years of experience in the corrections and criminal justice markets.
 - 5. Submit a listing of all jobs which the ESSC is presently or has been involved in litigation and the status thereof.
 - 6. Provide a list of all jobs where applying firm has been involved in liquidated damages or where delay damages were filed against the applicant's firm.
 - 7. Submit a current letter from the applying Electronic Security system equipment manufacturer stating the ESSC is factory trained, fully authorized distributor and installer of their complete line of products.
 - 8. Provide a letter from 'A' rated surety company that your company will be able to provide a Performance/Payment bond for this project if awarded the project.
 - 9. Name, address and telephone number of organization's current Bonding Company and level of bonding capacity.
 - 10. Name, address, telephone number, and contact person of organization's current bank and/or banks.
 - 11. Provide name, address, telephone number, and contact person for a minimum of five (5) trade references including major suppliers and/or subcontractors.
 - 12. The ESSC shall indicate complete and total compliance with the provisions of this specification by letter signed by an officer of the corporation or a principal, if other ownership currently exists.

13. Provide the Electronic Security system contractor's license number.
 14. Financial Statement for the most recent fiscal year.
 15. List of projects currently under construction including project size, scope and location.
- G. Installer Qualifications: Engage an experienced installer who is a factory authorized service representative to perform the work in this section.

1.06 REFERENCES

- A. The General Conditions, Supplementary Conditions, and Division 1 Specifications shall apply to all work of this section.
- B. The Contractor shall comply with the current edition of the following codes and standards as applicable:
1. NEC – National Electric Code
 2. NFPA – National Fire protection Association
 3. UBC – Uniform Building Code
 4. ANSI – American National Standards Institute
 5. ASTM - American Society for Testing and Materials
 6. EIA - Electronics Industry Association
 7. OSHA – Occupational Safety and Health Org
 8. NFPA 101 - Life Safety Code
 9. UL – Underwriters Laboratories
 10. Applicable Local Codes and Ordinances
 11. Manufacturers Recommendations
 12. Electrical Component Standard: Components and installation shall comply with NFPA 70. "National Electric Code.
 13. EIA Compliance: Comply with the Electronics Industries Association standards.
 14. Compliance with Local Requirements: Comply with the applicable building code, state and local ordinances, and regulations and the requirements of the authority having jurisdiction.

1.07 HAZARDOUS MATERIALS

- A. The ESSC shall ensure that no Asbestos Containing Building Materials (ACBM's) shall be installed in this project.

1.08 SUBMITTALS

- A. Provide descriptive literature, catalog cut sheets, illustrations, schematics, technical data sheets, and test data necessary for the Architect to ascertain that the submitted equipment and materials comply with the specification requirements. Include manufacturer's name, model, and catalog or part numbers. Catalog cut sheets shall be letter size (8.5" x 11") and shall be legible and clearly identify specific equipment being submitted. Identify specific items or parts on catalog cut sheets listing multiple models, items or variants.
- B. Submittal cut sheets shall be marked to show the specification section and paragraph number for which the item is submitted.
- C. Cut sheets shall be organized by specification division and in accordance with the order of the specifications governing the equipment.
- D. Shop drawings shall be submitted at the same time as the catalog cut sheets for a complete submittal.
- E. Provide system one-line drawings, conduit drawings, device layout drawings, device riser drawings equipment schedules, block diagrams, cabinet layouts and elevations, Touch screen layouts, mounting details and other system design drawings in ARCH E1 (30" x 42") format. Organize drawings by specification section. Drawings shall be sequentially numbered throughout the entire set.
- F. Provide load calculations for all electrical and electronic equipment provided under this division of the specifications.
- G. Provide detailed full-scale drawings or screen layouts of the graphic user interface for the touch screens.
- H. Provide manufacturer's roughing in diagrams, product specifications and instructions for installation.
- I. Provide description of operation of each system similar to that provided in this specification, to include any and all exceptions, variances, or substitutions.

- J. All submittals shall be provided in Adobe .PDF format. Submittals shall be provided electronically. The ESSC shall submit the necessary submittal criteria for all Security Electronics Divisions Listed under Division 28 23 00 section 1.02 A. as a complete submittal package, and for each subsequent re-submittal if necessary. All the necessary information the reviewer needs to properly evaluate the submission will be in one package each and every time it has to be reviewed. Failure to follow these submission requirements shall constitute the submittal as being non-compliant and will be returned as "Rejected/Resubmit".

1.09 TESTING AND DEMONSTRATION

- A. The integrated security control system, excluding field devices, shall be assembled complete and 100% tested in the ESSC's facility. This includes all applicable equipment cabinets, touchscreens, security management systems, intercom head-ends, CCTV head-ends, card access systems, watch tour systems, and any other component deemed necessary by the Architect to be demonstrated. All software for all systems shall be fully programmed and tested.
- B. The testing shall include attachment and proper operation of a typical field device to each and every point of field device connection. While testing is demonstrated to the Architect and owner, the Architect or Engineer may randomly choose field device connection points to be connected and operated. Because the system shall be 100% tested, these field devices must operate properly.
- C. The ESSC shall notify the Architect and owner 30 days prior to shipment of the equipment that the test is ready and shall coordinate with them to organize the date of the demonstration.

1.10 RECORD DRAWINGS

- A. At Project closeout, provide complete As-built installation drawings, updated to reflect all modifications or changes to the original submittal design drawings.
- B. All drawings shall be ARCH E1 (30" x 42") size, shall be compiled in a single Adobe .PDF file and shall be catalogued and book marked for convenient navigation. Provide bookmarks for each section heading as well as for each sub section. Also provide an index or outline page that lists the contents of the drawings, with links to each section.

1.11 OPERATION AND MAINTENANCE MANUAL

- A. At project closeout, provide a complete operation and maintenance manual. Include all product data, wiring diagrams, schematics, installation information and operation information. Provide the Operation and Maintenance manual on CD, DVD, or other digital storage media in Adobe Acrobat .PDF file format. Include the most current version of the Adobe Acrobat viewing software on the CD's or DVD's, or other digital media. Provide bookmarks for each section heading as well as for each sub section. Also provide an index or outline page that lists the contents of the manual, with links to each section and sub section of the manual.
- B. The following information shall be included on the cover page of the manuals:
1. "OPERATION AND MAINTENANCE MANUAL"
 2. List of the systems in the Operation and Maintenance manual
 3. Building name and location
 4. The name, address and telephone number of the ESSC.
- C. The manual shall be legible, well organized and easily read. Included in the manual shall be product operation manuals, software manuals, circuit drawings, wiring and control diagrams and shop drawings with data to explain detailed operation and control of each item of equipment and a control sequence describing start up instructions. Also included shall be installation instructions, maintenance instructions, safety precautions, test procedures, troubleshooting procedures, performance data, and other necessary documentation.
- D. A copy of the system certification and final tests results shall be included in this manual.
- E. Upon completion of the installation of the Electronic Security System equipment, the ESSC shall provide to the engineer a signed written statement, substantially in form as follows:
1. "The undersigned, having been engaged as the Electronic Security System Contractor on the (NAME AND ADDRESS OF THE PROJECT), certifies that the integrated security and touch screen

control system, was installed in a workman like manner and in accordance with the specifications, approved shop drawings and submittals and published wiring diagrams.”

- F. Provide to the owner at project closeout a USB Memory drive with copies of all configuration files used on this project along with the required Spare parts. This includes all project documentation as well as the PLC program, Touch screen configuration files, Configuration backups and any other software or configuration files related to this project.

1.12 DELIVERY STORAGE AND HANDLING

- A. Protect all materials and equipment from damage during storage at the site and throughout the construction period. Protect equipment and materials during shipment and storage against physical damage, dirt, dust, moisture, heat, cold, rain, and any foreign substances that may damage the equipment.
- B. Prevent damage from rain, dirt, sun and ground water by storing the equipment on elevated supports and covering them on all sides with securely fastened protective rigid or flexible waterproof coverings.
- C. Ship and haul all headend control cabinets with integrator's personnel.
- D. Install control room security equipment only when control rooms and other locations receiving equipment are clean, dry, and ready for the equipment. Control rooms and other locations receiving equipment should have all construction work, especially overhead ceiling work, and painting completed before installation. Rooms should have functioning security locks provided by the General Contractor or Construction Manager to secure them from damage and theft.
- E. Security electronics rooms shall also be clean, dry and ready for the panels to be moved in. Rooms should have all construction work done, absolutely finished, before equipment is moved in. The rooms should also be lockable with the General Contractor or Construction Manager providing the locks/keys.

PART 2 – PRODUCTS

2.01 GENERAL

- A. All equipment shall be new and shall be as specified for this project.
- B. All materials and equipment shall conform to the applicable standard or standards where such have been established for the particular product or material in question.
- C. Like materials shall be of the same manufacturer.
- D. See individual Division 28 Specification sections for system specific product requirements.

2.02 SYSTEM WIRING

- A. All low voltage wiring shall be West Penn CDT, Belden or approved equal.
- B. Wiring that extends from the electronic control relay terminal strips to the locks, lights, etc. shall be class 1, 2, or 3 as defined by Article 725 of the National Electric Code.
- C. All conductors to locks, doors, position switches, or gates shall be stranded wire and shall be a minimum number 14 THHN or THWN, 600 volt rated, and shall be installed in raceways and equipment enclosures with other conductors, within limitations defined by Article 725 of the National Electric Code.
- D. See subsections of this division for additional requirements.

2.03 CONDUIT AND RACEWAY

- A. All conduit, raceway and standard boxes and fittings shall be provided and installed by the Electrical contractor.
- B. Any additional specialty boxes and equipment racks shall be provided by the ESSC and Installed by the Electrical contractor.

2.04 RACKS AND ENCLOSURES

- A. The ESSC shall provide as necessary floor mounted enclosed 19” racks and/or wall mounted NEMA 1 hinged door enclosures to house control equipment. Racks manufactured by APC, Hoffmann, Lowell, Mid Atlantic, and Chatsworth are acceptable.
- B. Provide ventilation fans as required to maintain adequate airflow and recommended temperature threshold for electronic equipment.

- C. See section 28 23 80 for additional requirements.

2.05 SURGE SUPPRESSORS

- A. The ESSC shall provide surge suppressors for all electrically operated or monitored devices installed outside the building including exterior mounted cameras, intercoms, card readers, exterior doors, fence gates, vehicular gates etc.
- B. Surge suppressors manufactured by L-Com or Ditek, and rated for the proposed application will be acceptable.

2.06 UPS SYSTEMS

- A. Provide UPS backup for all electronic equipment under this section to power the connected equipment for a minimum of Twenty (20) minutes under "worst case" conditions in the event of a utility power failure.
- B. UPS systems manufactured by Liebert, Tripp Lite and APC and Cyber Power shall be acceptable.
- C. See section 28 23 80 for additional requirements.

PART 3 – EXECUTION

3.01 GENERAL

- A. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's instructions. All wiring shall be of the type and quantity recommended by the controls manufacturer, and hardware manufacturer, and approved by the local authority having jurisdiction.

3.02 MANUFACTURER'S INSTRUCTIONS

- A. Install all equipment in accordance with the manufacturer's recommendations and accepted shop drawings.
- B. Install all equipment in compliance with NEC requirements, NECA's "Standard of Installation" and recognized industry practices.

3.03 WIRING

- A. All wiring in the detention area (Jail) shall be installed in dedicated conduit throughout. Conductors routed to the individual device shall be continuous from the head end cabinet to the device.
- B. Cabling for security devices not located in the detention (Jail) area of the facility may be stubbed out above the finished ceiling and routed in J-Hooks or cable tray.
- C. It is not permitted to use a common wire either neutral or phase wire to a chase to power multiple devices.
- D. Each lockset must work independently from the other locksets. All home runs from field devices shall be continuous; there shall be no splices in wiring between the control equipment and the door locks, position switches, gates, card readers, cameras, intercoms, or other controlled or monitored device.
- E. All wiring shall be clearly identified and labeled according to the device it controls. Where possible, use architectural door numbers to identify cables or groups of wires.
- F. Where conduit is routed below grade, provide cabling rated for wet locations.
- G. All equipment wiring shall be laced and fastened in place using tie wraps or equal. Cabled runs shall be straight and either parallel or perpendicular to cabinet walls.
- H. The use of fingered wire duct such as Panduit or equal for signal wiring is preferable.
- I. All wiring systems shall be labeled and color coded in accordance with the labeling and color coding shown on shop drawings. Control system conductors shall not be spliced.
- J. All screw type terminals shall be captive clamp type terminals.
- K. Provide adequate length of conductors. Bundle, lace and route the conductors to terminal points in a uniform fashion without excess.
- L. All signal wiring shall be shielded. Line level audio circuits and loudspeaker circuits shall be adequately spaced from each other and from other power circuits.
- M. Maintain separation between signal level circuits and power circuits per NEC.

3.04 EQUIPMENT ENCLOSURES

- A. Maintain 3-foot working clearances on each side of equipment or equipment racks where access is required to inspect service or adjust.
- B. All equipment cabinets, boxes, enclosures or racks shall be clearly labeled and identified. Use identifiers and abbreviations defined in the Drawings wherever possible. Use plain designation for labeling, unless indicated otherwise.
- C. Provide weatherproof enclosures for items mounted outdoors or exposed to harsh environmental conditions.
- D. Check equipment against available mounting space indicated on the drawings. Coordinate location of equipment with other devices to minimize interference. Any conflicts or clearance problems shall be brought to the attention of the Engineer.
- E. See section 28 23 80 for additional requirements.

3.05 EXAMINATION

- A. Verify that related conditions, including equipment that has been previously installed under other related sections are acceptable for product installation in accordance with manufacturer's instructions.

3.06 PREPARATION

- A. All equipment related to the touch screen control, PLC and relay control system shall be fully assembled and factory tested prior to shipment to the jobsite.

3.07 TESTING

- A. The Electronic Security System, excluding field devices, shall be assembled complete and 100% tested in the security automation system integrator's facility. This includes all applicable equipment cabinets, touchscreens, security management systems, intercom headend(s), CCTV headend(s), card access systems, watch tour systems, and any other component deemed necessary by the engineer to be demonstrated. All software for all systems shall be programmed and tested.
- B. The testing shall include attachment and proper operation of a typical field device to each and every point of field device connection. While testing is demonstrated to the engineer and owner, the engineer may randomly choose field device connection points to be connected and operated. Because the system shall be 100% tested, these field devices shall operate properly.
- C. The security automation system integrator shall notify the engineers and owners 30 days prior to shipment of the equipment that the test is ready and shall coordinate with them to organize the date of the demonstration.

3.08 PROTECTION AND CLEANING

- A. Stored Materials and equipment excepting wire shall be stored in a controlled environment and must be protected from harmful conditions such as extreme temperature, moisture, humidity, and dirt.
- B. Repair or replace any damaged equipment or components prior to substantial completion.
- C. Remove temporary tags coverings and construction debris from interior and exterior surfaces of equipment.
- D. Clean internal air filters, grills, and fans before substantial completion.

3.09 WARRANTY

- A. The ESSC shall provide a single source parts and labor warranty for all equipment supplied under this section of the specifications. All equipment shall be free of defects in material, workmanship and programming for a period of one (1) year from the date of substantial completion.
- B. The warranty shall exclude Acts of God, lightning strikes (as long as grounding and surge protection specifications were adhered to), officer abuse or any unnatural abuse the owner.

3.10 SPARE PARTS

- A. See sub-sections of this specification for system specific spare parts requirements.

3.11 TRAINING

- A. The ESSC shall provide on-site training for a period of up to forty (40) hours, during normal business hours, to instruct the Owner's designated personnel on the operation and maintenance of the entire system.
- B. The training schedule shall be coordinated with the Architect and Owner.
- C. All training shall be recorded in digital format and organized by system type. Deliver DVD copies of the training to the owner with final closeout documents.

END OF SECTION

SECTION 282320
TOUCH SCREEN CONTROL SYSTEM

PART 1 – GENERAL**1.01 SUMMARY**

- A. The Touch screen Control System (TCS) shall provide control and monitoring of all electrically operated door hardware, motorized gates and doors, and other devices as indicated including, but not limited to, electric locks, sliding doors, vehicular gates, lighting circuits, water valves, inmate telephones, inmate televisions, CCTV camera call-up, inmate call in's and Intercom.
- B. The system shall monitor and annunciate the status condition of electrically equipped hardware, doors, gates, control conditions, security conditions, alarm conditions, Intercom calls, call-in signals, Duress Alarm signals, Panic alarm signals, and shall provide on-screen CCTV camera icon's for Camera switching and other functions as described herein and on the drawings. The system shall perform all logic functions as required to provide the operational characteristics as described herein and on the drawings. The system shall interface with other systems for control and annunciation including, but not limited to, the Lighting Control system, Inmate Water Valve control system, Intercom system and IP Video Surveillance System.
- C. The TCS is the core platform for the integrated security system. It is intended to be the primary operator interface for interaction between the operator and system components including Intercom, Lighting Utility and Power control, Duress Alarm, Panic Alarm, and CCTV. The TCS shall coordinate all communication among integrated security system components to achieve the specified functionality.
- D. The TCS shall generally consist of operator stations which include minimally a flat screen touch monitor sized as indicated on the drawings, a workstation computer with all necessary software, configuration files and licenses, UPS backup and a network connection to the system head end. The TCS communicates with the Programmable Logic Controller(s) (PLC) for device activation and monitoring as well as data connections to the various sub systems. The PLC monitors the status of connected devices and provides power switching and control through power switching relays.
- E. All equipment shall be new and shall be provided and installed in accordance with these specifications and approved submittals.
- F. The system shall allow fully granular control assignment at each touch screen location.
- G. The system shall be configured to provide automatic CCTV camera call-up upon intercom selection, either when an operator answers a call or when the operator initiates the call. Where there is no camera viewing a particular intercom station, no camera switching will occur. Where an intercom station is viewable by only one camera, that camera shall be associated with the intercom station. Where an intercom station is viewable by multiple cameras, the camera with the best view of the station shall be associated with the intercom station.
- H. The new system shall record and archive all system activities in a Security Management System (SMS) database that is searchable by user selectable parameters. Only authorized personnel shall have access to SMS data.
- I. The system shall allow any touch screen to control and monitor any device with proper login credentials.
- J. All interconnections between systems shall be data connections only and shall be coordinated by the touch screen system programmable logic. All operations shall be as herein described and as shown on the drawings.

1.02 RELATED SECTIONS

- A. Related work in other divisions that require close coordination with this division.
 - 1. Electrical
 - 2. Plumbing
 - 3. Painting and touch up
 - 4. Millwork
 - 5. Fire stopping
 - 6. Mechanical
 - 7. Concrete work including bases, anchors, pedestals or poles for exterior equipment.

1.03 SCOPE AND RESPONSIBILITY

- A. The TCS, Programmable Logic Controller and Relay control system shall be provided as a complete system by a single firm to assure that all components function as a seamless system.
- B. The TCS provider is responsible to include all integration programming and equipment as necessary to ensure that the TCS functions as the core security system and coordinates all security automation for related sub-systems.
- C. Although such work may not be specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a complete and operating system.

1.04 COORDINATION

- A. The Touch screen control system (TCS) provider shall coordinate with the Detention Equipment Contractor (DEC) to assure that all electrically operated and/or monitored devices are accounted for.
- B. The TCS system provider shall coordinate with the suppliers of subsystems with which the TCS integrates.

1.05 QUALITY ASSURANCE

- A. All equipment provided under this section shall be new and shall be provided by one of the firms listed herein or listed in a pre-bid addendum.
- B. It is a requirement of these specifications that the Touch screen control system be provided and by a qualified firm whose normal business is the design, configuration and production of electronic security and communications systems and equipment of a similar type and function as those specified herein.
- C. Any firm wishing to provide the Touch screen control system for this project must be pre-qualified and listed herein or in a pre-bid addendum.
- D. The following firms have been pre-qualified to provide the Touch screen control system.
 - 1. Accurate Controls – Ripon, WI
 - 2. B&E Communications – Jackson, MS
 - 3. CML Security - Erie, CO
 - 4. Cornerstone Electronics – Montgomery, AL
 - 5. Icotech, Inc. – Montgomery, AL
 - 6. Sustainable Security Solutions (S3) – San Antonio, TX
- E. The above listed pre-qualified firms have already been examined with regard to the below qualification requirements and as such are not required to apply for or submit any additional qualification information.
- F. Firms not listed above, wishing to provide the TCS for this project shall submit to the Architect a request for approval in accordance with the requirements of Division 28 23 00 Section 1.05

1.06 REFERENCES

- A. The General Conditions, Supplementary Conditions, and Division 1 Specifications shall apply to all work of this section.
- B. The Contractor shall comply with the current edition of the following codes and standards as applicable:
 - 1. NEC – National Electric Code
 - 2. NFPA – National Fire protection Association
 - 3. UBC – Uniform Building Code
 - 4. ANSI – American National Standards Institute
 - 5. ASTM - American Society for Testing and Materials
 - 6. EIA - Electronics Industry Association
 - 7. OSHA – Occupational Safety and Health Org
 - 8. NFPA 101 - Life Safety Code
 - 9. UL – Underwriters Laboratories
 - 10. Applicable Local Codes and Ordinances
 - 11. Manufacturers Recommendations

1.07 SUBMITTALS

- A. See section 28 23 00 for submittal requirements.

1.08 RECORD DRAWINGS

- A. See section 28 23 00 for Record drawing requirements.

1.09 OPERATION AND MAINTENANCE MANUAL

- A. See section 28 23 00 for Operation and Maintenance manual requirements.

1.10 SYSTEM ARCHITECTURE

- A. The Touch screen control stations shall be located throughout the facility as shown on the drawings and communicates to the Programmable Logic Controller(s) through TCP/IP communication.
- B. Each Touch screen shall operate independent of other Touch screens.
- C. The touch screens shall display the floor plan of the area being controlled. The floor plan shall be oriented so that the touch screen graphic matches the operator's orientation to the actual facility when facing the touch screen.
- D. All touch screens must be capable of controlling any part of the facility; however each station will have pre-defined primary screens for their local control area. Touch screens wishing to control devices outside of the pre-defined control area will require user name and password authentication.
- E. The new system shall be a distributed logic processing system that utilizes a decentralized logic processing architecture.
- F. The system shall utilize intelligent field I/O that proactively update the touch screen computers when a device state changes.
- G. The system shall encrypt all network control communications for security.
- H. The new system shall be segmented by control area so that each control area (housing units, booking, administration area etc.) will still be able to operate all local doors even if network connectivity to the rest of the system is lost.
- I. The new system shall designed to accommodate future expansion and shall allow unlimited scalability with no loss in performance including operational latency for both operator initiated actions or device indication.

1.11 SYSTEM INTEGRATION

- A. The TCS shall be interconnected through a data connection with the Intercom system to provide the following minimal functionality:
 - 1. Call initiation. An operator may place a call to an intercom station by momentarily pressing the associated intercom icon on the touch screen.
 - 2. Call in answer. Calls originating from staff stations shall be displayed on the touch screen. Operators may answer the call by momentarily pressing the flashing intercom icon.
 - 3. Press-To-Talk (PTT) Press To Talk icon that initiates the PTT function in the intercom system.
 - 4. Reset all. The Touch screen shall include a Reset All function that resets all active calls.
 - 5. Call Transfer. Allows one touch screen to transfer calls to another touch screen
 - 6. Call Forward. If a call remains unanswered for more than 60 seconds, the call is automatically forwarded to another touchscreen.
- B. The TCS shall be interconnected through a data connection with the Video Management System to provide the following minimal functionality:
 - 1. Event Linking. When an intercom call is answered or initiated, the system shall automatically display on the touchscreen, a live video stream from the associated camera. Provided a dedicated video viewing window for camera call-up.
 - 2. Direct camera switching. The Touch screen system shall include icons for each camera. Momentarily pressing the camera icon will cause the touch screen system to display a live video stream from the selected camera directly on the touchscreen. Provided a dedicated video viewing window for camera call-up.

- C. The TCS shall be integrated with the lighting and utility power control system to allow on-off control of all Detention area lighting and utility control relays. Coordinate with the Division 26 supplier for quantity and location of controlled devices as well as integration methods.
- D. TCS shall be integrated with the Inmate Water Valve control system to allow on-off control of inmate water valves. Refer to Division 22 specifications and P series drawings in the contract documents for controlled devices. Coordinate with the Division 22 supplier for final quantity and location of controlled devices as well as integration methods.

1.12 SYSTEM FUNCTIONS

- A. Door Unlock – Mechanical re-lock hardware. Where doors are equipped with solenoid, or motor operated locks, the following operation shall apply. Momentarily pressing the icon shall provide an unlock output to the hardware. If the hardware is provided with a mechanical hold-open feature, the pulse shall be of sufficient duration to bring the hardware to full unlock. If the hardware is not provided with a mechanical hold-open feature, then the pulse shall be sufficient to provide a 3 second unlock period. Activation of the icon is annunciated by a change in state of the icon and an audible beep. The icon shall function as an indicator for each door to indicate the status of the door. A portion of the icon shall be green when the door is closed and locked (secure). And portion of the icon shall be red when the door is closed and locked (secure). The default state of the icon shall be un-secure. (red) the icon shall only display green when the door hardware positive indication of secure status.
- B. Door Unlock – Electrical re-lock hardware. Where doors are equipped with Motor operated locks, requiring one output to cycle the lock to the unlocked state and a second operation to cycle the lock to the locked state, the following operation shall apply. Momentarily pressing the icon shall provide an unlock the output to the hardware. The unlock pulse shall be of sufficient duration to bring the hardware to full unlock. The system shall allow the hardware to remain unlocked for three (3) seconds and shall automatically send the relock output. Output times shall be adjusted to match the requirements of the lock manufacturer. Activation of the icon is annunciated by a change in state of the icon and an audible beep. The icon shall function as an indicator for each door to indicate the status of the door. A portion of the icon shall be green when the door is closed and locked (secure). And portion of the icon shall be red when the door is closed and locked (secure). The default state of the icon shall be un-secure. (red) the icon shall only display green when the door hardware positive indication of secure status.
- C. Interlock and Interlock Override – Where two or more doors or gates with electric hardware form a sally port or where interlocks between hardware sets are indicated on the plans, the operation of the individual hardware sets shall be as specified elsewhere with the following modifications. Each door within the interlock group shall have a yellow interlock active indicator. The indicators in the group shall not be visible unless the group is interlocked. The controls shall allow only one of the hardware sets in the interlock group to be un-secure at any given time unless the interlock override function is activated. The interlock override function shall be activated by pressing the interlock override icon. Interlock override shall then latch on for a period of ten (10) seconds. Upon activating the interlock override function, the yellow interlock active indicators over the interlocked doors shall turn off and allow the operator to control all hardware with no interlock restrictions. After the 10 second override period, the system shall return to the secured interlock condition. All Touch screen control stations controlling interlocked doors shall have the interlock override icon's and annunciator provisions. The yellow interlock active icon's over the interlocked doors shall illuminate on all Touch screens controlling hardware in a given interlock scheme. One and only one unsecured door shall cause a hardware set to become interlocked. Emergency release or Fire release shall override all interlock restrictions. The interlock shall not prevent the authorized door from operating multiple times in both open and closed functions, provided all other doors in the interlock scheme are secure.
- D. Motorized Doors and Gates, Vehicle Sally-Ports & Cell Sliders – Where motor operated doors and gates are installed, the following operation shall apply. Pressing the “open” icon shall cause the door or gate to travel to the open position. Pressing the “close” icon shall cause the door or gate to travel to the locked, closed position. Pressing the “stop” icon while the door is traveling in either direction shall stop the door. Operating the door from “open” to “close” or “close” to “open”, without pressing “stop” shall stop the door for a minimum of 3 (three) seconds and then reverse the direction of travel. There shall be an icon indicator for each door to indicate the status of the door. The indicator shall illuminate green when the door is closed and locked (secure). The indicator shall illuminate red anytime the door is open or

- unlocked (un-secure). The default state of the icon shall be un-secure. (red) the icon shall only display green when the door hardware provides positive indication of secure status.
- E. Monitored Only Door Status – There shall be an icon indicator for each door that is equipped with monitoring hardware to indicate the status of the door. This shall be the case even for doors that do not have electrically operated locks but are equipped with a door position switch or a bolt position switch. The indicator shall illuminate green when the door is closed and locked (secure). The indicator shall illuminate red anytime the door is open or unlocked (un-secure). The default state of the icon shall be un-secure. (red) the icon shall only display green when the door hardware positive indication of secure status.
- F. Manual Fire Emergency Release – Emergency Fire release shall be accomplished in two stages. The first stage is “Egress door release” This shall cause all of the doors in the pre-determined Egress Door group to unlock and remain unlocked. Activation of Egress Door Release shall be annunciated by a pulsing audible beep and a flashing red screen titled “EGRESS DOOR RELEASE ACTIVE!”. The second stage is “Cell Door Release” This shall cause all of the cell doors that are in the pre-determined “Cell Door Release” group to unlock and remain unlocked. Activation of Cell Door Release shall be annunciated by a pulsing audible beep and a flashing red screen titled (CELL DOOR RELEASE ACTIVE!”. Provide an icon labeled “ERLS Silence” that will silence the audible annunciators for both emergency release functions. There shall be an icon labeled “Egress Door Release Reset” that will reset Egress Door Release and an icon labeled “Cell Door Release Reset” that will reset Cell Door Release. See the plans for Emergency Release door designations. Activation of either emergency release group shall only be permitted with proper password authentication. Provide a screen that appears after pressing the release icon that prompts the user to verify if they are sure that they want to activate emergency release. If the user selects “NO” return to normal operation. If the user selects “YES” then provide a screen that prompts the user for a password. The correct password must be supplied to activate either emergency release function. Coordinate with the Engineer and owner to define which doors will be emergency released.
- G. Lighting and Power Control – Lighting circuits, as shown on the plans, shall be switched by relays with minimum 20 amp contacts, UL rated for lighting control applications. Relays shall be controlled by icon’s Touch screen control station. Activating the icon shall turn on the lights and cause the icon to change state to indicate that the light is on. Activating the icon again shall turn off the lights and cause the icon to return to its initial state. Activation of the icon is annunciated by a change in the icon’s state and an audible beep. The lighting control relay panel shall be provided under this contract. See plans for required number of panels and circuits.
- H. Television Receptacle Control – The 120-volt television receptacle in each jail area space shall be switched by line voltage relays controlled by icon’s on the Touch screen Control Station. Activating the icon shall turn on the receptacle and cause the icon to change state to indicate that the receptacle is on. Activating the icon again shall turn off the receptacle and cause the icon to return to its initial state. Activation of the icon is annunciated by a change in the icon’s state and an audible beep. Television receptacle circuits shall be controlled through relays in the lighting control panel. See drawings for required number of panels and circuits.
- I. Inmate Dayroom Pay Telephone Control – The pay telephones in each dayroom area space shall be controlled by remote relays (provided by this section) controlled by icon’s on the Touch screen Control Station. Activating the icon shall turn on the telephones and cause the icon to change state to indicate that the telephones are on. Activating the icon again shall turn off the telephones and cause the icon to return to it’s initial state. Activation of the icon is annunciated by a change in the icon’s state and an audible beep.
- J. CCTV Cameras – CCTV cameras shall be represented on the Touch screen Control Stations by distinct icon’s. Each camera is further identified with its number adjacent to the CCTV camera symbol location. Activating the camera icon shall cause the selected camera to be displayed in the camera viewing window on the touchscreen.
- K. Intercom stations – Intercom sub stations shall be represented on the Touch screen Control Stations by distinct icon’s. Each Intercom station or paging zone shall further be identified with its number adjacent to the intercom icon symbol. When a call is received, the icon shall flash and an audible beep shall sound. If the operator is not viewing the page where the call originated, then a flashing intercom icon shall appear on the screen navigation bar over the link for the screen where the call is. Selecting the icon shall open

the talk path and allow the operator to listen. Pressing the PTT (Push To Talk) switch shall allow the operator to talk to the selected station. Selecting the station icon shall reset that station.

- L. Inmate Call in buttons – Cells equipped with an inmate call in button shall include an icon on the touch screen controlling the cell. Icons will be gray when inactive and yellow when active. When an inmate presses the call button, the icon shall change from gray to yellow and flash at a one second interval and a unique audible tone shall sound. When the operator selects the icon it will stop flashing, go solid yellow and the audible sound will end. Selecting the icon again will clear the call in and return the icon to its normal state.
- M. Duress call in buttons – When a Duress button is pressed, the associated icon will illuminate red and flash at a one second interval. It will also activate a unique emergency audible tone. The operator can select the active icon and it will stop flashing, go solid red and the audible tone will be silenced. In order to reset the panic alarm, the field device (switch) must first be reset. Then the operator can select the solid red active panic icon and it will prompt the operator for a valid username and password. When a valid username and password are entered the alarm will reset.
- N. Auto Switching – Provide automatic CCTV camera switching when the call button on an Intercom stations that is in direct view of a CCTV camera is pressed. This shall take place with on action required by the operator. When the call button on the intercom button is pressed, the associated CCTV camera shall be automatically switched to the video viewing window on the touchscreen. When the Intercom call has been reset, the window shall return to a blank view. The system shall buffer multiple incoming calls in the order they are received.
- O. Emergency Disable – Provide an icon titled “Emergency Disable” on every touch screen. Activating this function shall disable the Touchscreen Control Station and display a black screen with the message: “THIS TOUCH SCREEN HAS BEEN DISABLED AND CAN ONLY BE RE ACTIVATED BY CENTRAL CONTROL”. In order to re-activate the TCS, the proper administrator level password must be supplied from the central control touch screen. Entering a global “Duress” username and password will re activate the touch screen control station however it will simultaneously send a distinct emergency duress message to all other touch screens, alerting them that there is an emergency at that station. Provide a re-activate icon at central control for all touch screen locations and prompt for password authentication. When Emergency Disable is active, the shutdown condition shall be annunciated at all other Touch screen Control Stations, specifying which TCS has be shut down.
- P. Authentication – Provide multi-level, multi-user login control. The login username and password determine which screens and functions the user may access.
- Q. Provide a system configuration utility. The system configuration utility is used to configure system variables including but not limited to:
 - 1. Auto log out time
 - 2. Users and passwords
 - 3. User access levels
 - 4. Auto re lock time for two stage locking device

1.13 SECURITY MANAGEMENT SYSTEM

- A. Provide automatic data archival that tracks all system actions including:
 - 1. Operator log in and log off
 - a. Time and date
 - b. Username
 - c. Touch screen location
 - 2. Door Unlock
 - a. Time and date
 - b. Door Location (Device ID)
 - c. Operator
 - d. Initiating touch screen
 - 3. Door unsecure
 - a. Time and date
 - b. Location (device ID)
 - c. Alarms

- d. Time and date
 - e. Device Location
- 4. System errors, faults
 - a. Time and date
 - b. Error description
- B. Provide an audit and reporting system that allows sorting and filtering of system data and the generation of standard and custom reports.
- C. The reporting system must be accessible by a standard PC computer connected to the LAN and must be password protected to prevent unauthorized use.
- D. The data reporting and archive system shall not interfere in any way with the operation of the Touch screen system.

1.14 GRAPHIC USER INTERFACE (GUI)

- A. The Touch Screen Control Station shall provide an icon for each controlled or monitored device including: door lock, lighting circuit, television outlet, dayroom receptacle, dayroom telephone, intercom station, Paging speakers, CCTV camera, or other devices, as designated on the plans or indicated by the specifications.
- B. icon's for different functions shall be clearly distinguished by color and by design. Use symbols to graphically represent the type of hardware being controlled by each icon such as a speaker symbol for intercom stations, or a lock for door control. Screens shall reflect a graphic layout of each area that is being controlled.
- C. The Touch screen shall be capable of providing audible feedback for any touch activation unless specified otherwise.
- D. The Touch screen shall offer easy navigability from any screen to any screen, and shall always display which screen is currently being viewed. Provide a navigation bar that will allow one- touch navigation to any of the other screens that the operator is authorized to view.

1.15 SYSTEM PERFORMANCE

- A. The maximum time permitted for page turns shall be 100 ms. The maximum time permitted for the execution of a command (the time between the activation of an icon and when the selected function takes place) shall be 100 ms. Control and navigation icons shall be clearly identified and differentiated by symbol and color.
- B. The system shall annunciate alarms including such screen display video graphic alarm display an audible tone in 200 ms or less from the time the field device is activated. Alarm audible tones shall be distinctly discernable from intercom call in tones and touch screen audible feedback tones.
- C. Touch screen terminals shall not be interdependent. The failure of one touch screen terminal shall not affect the operation of other touch screen terminals.
- D. Each touch screen station shall include a licensed copy of the GUI software.
- E. System faults or crashes shall not be capable of activating field outputs such as door locks during system failure or reboot.

PART 2 – PRODUCTS

2.01 GENERAL

- A. All equipment shall be new and shall be as specified for this project.
- B. All materials and equipment shall conform to the applicable standard or standards where such have been established for the particular product or material in question.
- C. Like materials shall be of the same manufacturer.

2.02 WIRING

- A. All equipment wiring shall be laced and fastened in place using tie wraps or equal. Cabled runs shall be straight and either parallel or perpendicular to cabinet walls.
- B. All wiring shall be stranded.

- C. The use of fingered wire duct such as Panduit or equal for signal wiring within cabinets is preferable.
- D. All wiring systems shall be labeled and color coded in accordance with the labeling and color coding shown on shop drawings. Control system conductors shall not be spliced.
- E. All screw type terminals shall be captive clamp type terminals.
- F. Provide adequate length of conductors. Bundle, lace and route the conductors to terminal points in a uniform fashion without excess.
- G. All signal wiring shall be shielded. Line level circuits and loudspeaker circuits shall be adequately spaced from each other and from other power circuits.
- H. Maintain separation between signal level circuits and power circuits per NEC.
- I. White conductors shall only be used for neutral conductors and green only for grounding conductors.

2.03 NETWORK EQUIPMENT

- A. Provide a 10/100/1000 Mbps Base T Ethernet system (IEEE 802.3z / 802.3ab), for communication between Touch screen Workstations, Programmable Logic Controllers, and other connectable devices to be installed under this section of work.
- B. The 10/100/1000 Mbps Base T Ethernet switches shall be manufactured by CISCO Systems, MOXA, HP, Dell, Lantronix or approved equal. Provide the quantity of nodes as required to accommodate the equipment to be connected.
- C. Ethernet cabling shall be Category 6 minimum.

2.04 RACKS AND ENCLOSURES

- A. Wall mounted equipment shall be installed in NEMA 1 hinged door enclosures with a removable steel mounting plate.
- B. Size enclosures in accordance with the number of relays and terminals required for the project.
- C. Cabinets shall be ANSI 61 gray polyester powder coated. Mounting plates shall be painted white.
- D. Rack mounted equipment shall be installed in 44U floor mounted EIA equipment racks. Racks manufactured by APC, Hoffmann, Lowell, Mid Atlantic, and Chatsworth are acceptable.
- E. Provide adequate ventilation in enclosures and racks to dissipate excess heat.

2.05 PROGRAMMABLE LOGIC CONTROLLER

- A. The Programmable Logic Controller (PLC), Programming software, backplane, input modules, output modules, communication modules and other related equipment shall be the standard product of a single manufacturer with national distribution, regularly engaged in the business of manufacturing programmable logic controllers.
- B. The Programmable Logic Controllers provided for this project shall support all devices and special functions as described in the specifications and shown on the drawings. PLC programming and subsequent programming techniques shall not vary from the main controller to remote PLC's. The program shall be stored in a non-volatile solid state memory unit. The processor shall communicate with all I/O points directly across the PLC back plane or to a remote backplane via Ethernet communication.
- C. The Processor shall include an Ethernet / IP port for communication.
- D. The Processor shall include a serial port for firmware updates.
- E. The Processor and input and output circuitry shall be of a modular design.
- F. UL 294 listed equipment is not approved for this section.
- G. All system modules, main and expansion chassis shall be designed to provide for free air flow convection cooling. No internal fans or other means of cooling except heat sinks shall be permitted.
- H. Communication between the processor and remote I/O bases shall be Ethernet / IP only.
- I. All microprocessor-based equipment supplied shall be certified by the manufacturer to meet or exceed the following environmental operating specifications:
 - 1. Ambient Temperature - Operational 0 to 60 C.
 - 2. Storage 40 to +80 C.

- 3. Ambient Humidity - 50 to 95%, RH non-condensing
- J. The controller shall have an integral power supply that accepts a voltage input range of 105 VAC to 130 VAC and shall include an integral circuit breaker or replaceable fuse for overload protection.
- K. The I/O modules shall indicate the status of all input and output points.
- L. All remote I/O must include a base with embedded Ethernet network connectivity to the PLC LAN. Systems requiring serial data communication to each I/O card will not be acceptable. All I/O cards must be interchangeable and shall only require re-addressing to be moved from one slot to another slot.
- M. All I/O devices shall be equipped with system self-diagnostic capabilities.
- N. Programmable Logic Controllers, Input Modules, Output Modules, Cables, Associated Power supplies and other PLC accessories shall be manufactured by Omron. No exceptions.

2.06 POWER SUPPLIES

- A. Provide logic power supplies as necessary to operate all relays and electronic equipment.
- B. Power supplies shall be regulated, filtered switching type power supplies meeting the following minimum requirements:
 - 1. Nominal Input voltage
 - 2. Nominal Output voltage
 - 3. MTBF >500,000 Hours
 - 4. Ambient temperature operating range -25C to 70C.
- C. Size power supplies to accommodate 150% of the maximum load that could ever be imposed at any given time.

2.07 LOCKING CONTROL RELAYS

- A. Provide locking control relays to perform switching of electrical power to the locks, sliding doors, gates and other controlled devices. All relays shall be UL listed and NEMA or IEC rated, and mounted in the cabinet or rack containing the PLC I/O. The cabinets shall be mounted where shown on the drawings.
- B. The locking control relays shall be electromechanical type that are rated for at least 50% more current capacity than required for any given control function, but in no case less than 10 amps. The relays shall be operated at an input voltage of 24VDC, and the output shall be capable of switching any voltage up to 140 VAC, at the rated output current.
- C. Solid State or optically isolated solid-state relays are not acceptable.
- D. Each relay is to be fused in such a way as to meet National Electric Code distribution requirements and to protect the relay and other circuitry from a short circuit failure at the lock.

2.08 LIGHTING AND UTILITY RELAYS

- A. The lighting control, Dayroom receptacle and TV receptacle relay shall have a latching mechanical contact.
- B. Each relay shall be rated with a minimum of a 20 amp contact and shall be rated for the line voltage controlled.
- C. Relays shall be momentary pulsed for on and off control.
- D. The lighting control and utility control relay shall be U.L. recognized.

2.09 TERMINALS

- A. Provide pluggable terminals for all field wire connections except lighting and utility line and load connections.
- B. Terminals shall have captive clamp or compression type screw terminals and shall be rate for 15 amps per lock control circuit minimum and 20 amps per lighting control circuit.
- C. Terminals manufactured by Tyco, Phoenix Contact or Weidmuller are acceptable.

2.10 FUSES AND FUSE HOLDERS

- A. Fuse all door locks and other devices using Littlefuse 3AG or Bussman AGC series 1 ¼" replicable glass fuses.

- B. Size fuses in accordance with lock manufacturer's recommendations.
- C. Provide fuse holders for each door lock.
- D. Fuse holders shall be rated for 150% of the maximum load that may ever be imposed but in no case less than 15 amps.
- E. Fuse holders shall allow fuses to be safely removed without risk of electric shock.
- F. Fuse holders manufactured by Phoenix Contact, Littelfuse, or Bussmann are acceptable.

2.11 INPUT PROTECTION

- A. Provide field replaceable optical input isolation for all system inputs to prevent surges, spikes or short circuit conditions from damaging I/O modules and better high frequency noise rejection.
- B. Opto-isolators shall have a minimum Voltage RMS rating of 5300 VRMS.

2.12 TOUCH SCREENS

- A. Each control location where a touch screen is shown on the plans shall be equipped with an Elo 3243L or 3202L 32 inch flat panel LCD touch monitor with intelli-touch plus touch technology. Provide a keyboard and standard two button mouse with scroll button at each location as an auxiliary method of operator input.

2.13 TOUCH SCREEN MOUNTING HARDWARE

- A. Provide mounting hardware for touch screens that allows the touch screen viewing angle to be adjusted for either seated or standing operation. The mounting hardware shall attach to the touch screen with standard VESA mounting hardware and shall allow operators to individually adjust the screen to the most ergonomic screen position. The touchscreen base shall attach to or be mounted on standard horizontal millwork.

2.14 TOUCH SCREEN COMPUTER

- A. Provide at each touch screen control location a workstation type computer manufactured by Logic Supply, IBM, HP or Dell which shall meet these minimum requirements:
 - 1. Intel Core i7 processor
 - 2. 16 Gb RAM
 - 3. 256MB SSD
 - 4. High performance video graphics card – 8GB video card (Direct3D/ OpenGL compatible) with HDMI or DisplayPort video out
 - 5. 10/100/1000 Mbps Ethernet (Motherboard)
 - 6. 10/100/100 Mbps PCIe Secondary ethernet adapter for IP Video interface
 - 7. 3 button mouse
 - 8. Keyboard
 - 9. Microsoft Windows 11 Professional 64 bit operating system.
 - 10. Touch screen HMI / GUI software and necessary license and software key or USB dongle.
- B. The touch screen computer shall be configured to automatically start when power is applied without the need to press a power button.

2.15 TOUCH SCREEN SOFTWARE

- A. Provide a licensed copy of all necessary GUI (Graphic User Interface) software for each Touch Screen Computer.
- B. The software will convey an accurate Graphic floor plan for all areas that require display on the LCD displays. The software will utilize the maximum resolution and colors of the display to enhance and simplify the displayed control and status information. Fast orientation and ergonomics will be the goal of all system displays.
- C. Provide the following global functions for all touch screens:
 - 1. Operator log-on Provide an on-screen keyboard for username and password entry without the user of a physical keyboard.
 - 2. Operator log-off. Allows the active user to log off and exit to the log on screen.
 - 3. Control area map. Provide a graphic map index that allows the operator to select the control area.

4. Logged on user. Displays the username for the actively logged on user.
 5. Time and date. Displays the current time in 24 hour format and the date in MM/DD/YYYY format.
- D. The software will provide login security password protection for all TCS's. There shall be a minimum of sixty four (64) levels of access. The software will provide a database for users. The database shall support a minimum of five hundred (500) users.
- E. The following GUI Software providers are acceptable:
1. Rockwell Automation (Allen Bradley)
 2. AVEVA™ Edge (formally Indusoft web studio)
 3. AVEVA™ InTouch HMI (formally Wonderware)
 4. CAM Professional
 5. Simplicity Group
- F. The control software shall be configured to automatically start as soon as the operator has logged into Windows. The software will execute and present the operator with the login screen to the software.
- G. All ladder logic, HMI files, and any other custom developed software or configuration files shall be delivered on a USB drive to the owner at the project closeout.
- H. All software licenses shall be transferred to the Owner at completion of the project. This shall include but not be limited to all original installation disks, software manuals, equipment manuals, etc.; all project specific application software shall be transferred at the end of warranty period.

2.16 UPS SYSTEMS

- A. See section 28 23 80 for UPS requirements.

PART 3 – EXECUTION

3.01 GENERAL

- A. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's instructions. All wiring shall be of the type and quantity recommended by the controls manufacturer, and hardware manufacturer, and approved by the local authority having jurisdiction.

3.02 MANUFACTURER'S INSTRUCTIONS

- A. Comply with all manufacturers' published product data including product bulletins product catalog, installation instructions, diagrams, schematics and mounting details.

3.03 WIRING

- A. It is not permitted to use a common wire either neutral or phase wire to a chase to power multiple devices.
- B. Each lockset must work independently from the other locksets. All home runs from field devices shall be continuous; there shall be no splices in wiring between the control equipment and the door locks, position switches, gates, card readers, cameras, intercoms, or other controlled or monitored device.
- C. All wiring shall be clearly identified and labeled according to the device it controls. Where possible, use architectural door numbers to identify groups of wires.
- D. All equipment wiring shall be laced and fastened in place using tie wraps or equal. Cabled runs shall be straight and either parallel or perpendicular to cabinet walls.
- E. The use of fingered wire duct such as Panduit or equal for signal wiring within cabinets is preferable.
- F. All wiring systems shall be labeled and color coded in accordance with the labeling and color coding shown on shop drawings. Control system conductors shall not be spliced.
- G. All screw type terminals shall be compression type or captive clamp type terminals.
- H. Provide adequate length of conductors. Bundle, lace and route the conductors to terminal points in a uniform fashion without excess.
- I. All signal wiring shall be shielded. Line level circuits and loudspeaker circuits shall be adequately spaced from each other and from other power circuits.
- J. Maintain separation between signal level circuits and power circuits per NEC.

- K. White conductors shall only be used for neutral conductors and green only for grounding conductors.

3.04 LABELING

- A. Label all components clearly with a consistent labeling scheme. Labels shall be cross referenced to wiring schematics for easy reference.
- B. Label all relays, terminal points, fuse holders, I/O modules, circuit breakers, power supplies and any other control equipment.

3.05 INSTALLATION

- A. Furnish all equipment, tools, labor, system setup and other services necessary for the proper installation and testing of the products and system as described herein and shown on the drawings.
- B. Install in accordance with manufacturers' handling and installation instructions.
- C. Install in accordance with all NEC, local and applicable codes and regulations.

3.06 EXAMINATION

- A. Verify that related conditions, including equipment that has been installed under other sections, are acceptable for product installation in accordance with the manufacturer's recommendations.

3.07 PREPARATION

- A. All equipment related to the touch screen control, PLC and relay control system shall be fully assembled and factory tested prior to shipment to the jobsite.

3.08 TESTING

- A. The system shall be installed and fully field tested under the supervision of a technician, trained for the said system.
- B. The system shall be demonstrated to perform all of the functions shown on the plans and as specified herein.
- C. Document all test procedures and protocols and provide a copy of test results for each system to the Engineer prior to substantial completion.

3.09 PROTECTION AND CLEANING

- A. Stored Materials and equipment excepting wire shall be stored in a controlled environment and must be protected from harmful conditions such as extreme temperature, moisture, humidity, and dirt.
- B. Repair or replace any damaged equipment or components prior to substantial completion.
- C. Remove temporary tags coverings and construction debris from interior and exterior surfaces of equipment.
- D. Clean internal air filters, grills, and fans before substantial completion.

3.10 WARRANTY

- A. The ESSC shall provide a single source parts and labor warranty for all equipment supplied under this section of the specifications. All equipment shall be free of defects in material, workmanship and programming for a period of one (1) year from the date of substantial completion.

3.11 SPARE PARTS

- A. Provide at project closeout the following spare parts:
1. Two spare Input modules (of each type used)
 2. Two spare Output modules (of each type used)
 3. One spare Ethernet communication base
 4. Ten (10) spare relays of each type used
 5. Twenty-Five (25) spare fuses of each type used

3.12 TRAINING

- A. See section 28 23 00 for training requirements.

END OF SECTION

SECTION 282330
INTERCOMMUNICATION SYSTEM**PART 1 – GENERAL****1.01 SUMMARY**

- A. Furnish and install a complete and operable Detention Grade Audio Inter-Communication System as shown on the drawings and herein after described. The system shall be capable of high quality, reliable, and satisfactory operation as herein described.
- B. Furnish and install all required Data Network Interfaces, Workstation Computers, Software, and Associated Accessories required for a complete and operable system as herein described.
- C. One complete and operable system shall be provided and defined as all components, cables, back boxes, contacts, software, etc. to achieve a complete and functional system. Also included are all power supplies, hardware, and interfaces to equipment supplied by others. Documents do not show or list every item to be provided. When an item not shown or listed is clearly necessary for proper installation and operation of the equipment and systems, provide, install, and test/certify, the item at no increase in contract price.
- D. Provide desk mounted intercom master stations adjacent to each touch screen location as shown on the drawings.

1.02 SYSTEM COMPONENTS

- A. The Detention Grade Audio Inter-Communication System shall be of one manufacture regarding software, Power Supplies, Call Stations, Annunciators and Staff Communication devices.
- B. All components required for a complete and operable system as described shall be included whether or not specifically described here in.
- C. Wiring will be in accordance with the manufacture of the Detention Grade Audio Inter-Communication System.
- D. Provide all software, hardware, and system programming for complete and functional system.
- E. Provided installation, testing, adjustment, and initial programming for all equipment. Include written documentation and instructions for system as installed.
- F. The contractor shall be responsible for fully implementing the functions described in the Specifications and shown in the Drawings.
- G. The Contractor shall possess all applicable licenses.
- H. Provided training to the Owner in the operation, adjustment, servicing and repair of the systems
- I. Connect all systems and equipment to emergency generator power.
- J. Co-ordinate all telephone and telecom connections, network connections, programming and requirements with building Owner's representative.

1.03 SCOPE OF WORK

- A. The Intercom system head end equipment shall be located in Equipment Room 1127 as shown on the drawings.
- B. The system shall be integrated with the Touchscreen Control system so that intercom calls may be placed or answered from the TCS graphic interface.

1.04 RELATED SECTIONS

- A. Related work in other divisions that require close coordination with this division.
 - 1. Security Electronics General
 - 2. PLC and Relay Control System
 - 3. Touchscreen Control System
 - 4. Electrical
 - 5. Painting and touch up
 - 6. Fire stopping
 - 7. Mechanical

8. Concrete work including bases, anchors, pedestals or poles for exterior equipment.

1.05 CONTRACT DRAWINGS

- A. The Drawings indicate the arrangement of Intercommunication equipment. Review architectural Drawings for door swings, cabinets, counters, and built-in equipment; conditions indicated on architectural Drawings shall govern for this work. Coordinate the installation of equipment with the structural, mechanical and electrical equipment and access thereto. Coordinate installation of recessed equipment with concealed ductwork and piping and wall thickness. Do not scale security Drawings.
- B. Device locations are approximate. Actual device locations shall be field coordinated with all other trades and applicable code requirements. Location of all components of the Intercom system including staff stations, paging speakers, intercom master phones, intercom exchanges, amplifiers, racks, etc. indicated on the contract drawings is approximate unless specified dimensions are shown. Components and field devices shall be field located for proper use of the device with consideration given to other equipment (i.e. light fixtures, HVAC diffusers, sprinkler heads, etc.) installed in the immediate vicinity.

1.06 QUALITY ASSURANCE

- A. All equipment provided under this section shall be new and shall be the standard product of the manufacturers listed herein or listed in a pre-bid addendum.

1.07 REFERENCES

- A. The General Conditions, Supplementary Conditions, and Division 1 Specifications shall apply to all work of this section.
- B. The Contractor shall comply with the current edition of the following codes and standards as applicable:
 1. NEC – National Electric Code
 2. NFPA – National Fire protection Association
 3. UBC – Uniform Building Code
 4. ANSI – American National Standards Institute
 5. ASTM - American Society for Testing and Materials
 6. EIA - Electronics Industry Association
 7. OSHA – Occupational Safety and Health Org
 8. NFPA 101 - Life Safety Code
 9. UL – Underwriters Laboratories
 10. Applicable Local Codes and Ordinances
 11. Manufacturers Recommendations

1.08 SUBMITTALS

- A. See section 28 23 00 for submittal requirements.

1.09 RECORD DRAWINGS

- A. See section 28 23 00 for record drawing requirements.

1.10 OPERATION AND MAINTENANCE MANUAL

- A. At See section 28 23 00 for operation and maintenance manual requirements.

1.11 DELIVERY AND HANDLING

- A. Comply with Division 1 product requirements section.
- B. Deliver materials in manufacturer's original, unopened, undamaged packaging with identification labels intact.
- C. Store materials and equipment in an area protected from harmful environmental conditions. Store in accordance with manufacturers recommendations or published environmental tolerances. After installation, protect equipment from exposure to dust, dirt, paint, water or other damaging substances.

1.12 STANDARD SYSTEM FEATURES

- A. Control: The Detention Grade Audio Inter-Communication System shall provide two-way audio communication between Master or Operator Locations and Remote Intercom station locations as indicated on the plans. Intercom communication control shall be provided by the Programmable Logic

Controller (PLC) system specified separately and provide individual station selection from the touch screen Master. Communication shall be automatic Listen for the Master from any station selected. A Push to Talk button shall allow the Master station to control the direction of communication from listen to talking to the Remote station.

- B. Call Annunciation: The Detention Grade Audio Inter-Communication System shall provide Call-In buttons on all Remote stations to call a Master. When the intercom Remote Call-In button is pressed, the related Remote station select icon at the Touchscreen shall blink On and Off and have a repeating tone to alert the Operator that a Remote station is calling in.
- C. Call Answering: When a flashing Remote station icon is selected the icon shall change from flashing to On steady and the call tone shall be silenced. Once answered or selected the icon shall remain On steady until the station select button is pressed again to terminate the call.
- D. Call Privacy: When a call is answered or placed to inmate areas including cells, the intercom shall not provide any audio or visual indication at the Remote station to indicate that the Master is listening to the station.
- E. Paging: The Detention Grade Audio Inter-Communication System shall provide Zone Paging to both Remote Intercom Stations and general area speakers.
- F. All user interfaces shall employ moisture and electrostatic resistance to provide reliable yet friendly operation. Device quantities and locations shall be as shown on the plans. Any device not shown on the plans but required for full operation of the system as specified shall be included.

PART 2 – PRODUCTS

2.01 GENERAL

- A. All equipment shall be new and shall be as specified for this project.
- B. All materials and equipment shall conform to the applicable standard or standards where such have been established for the particular product or material in question.
- C. Like materials shall be of the same manufacturer.

2.02 EQUIPMENT

- A. The Detention Grade Audio Inter-Communication System Operator Desk Console shall be a vandal resistant metal enclosure including a microphone, a speaker, and control push buttons. The console shall have a powder coated metal base with a stainless steel faceplate. The face shall be Laser Engraved to prevent wear and destruction of labeling. One button shall be labeled "Talk" (PTT) and the other is "Page". The microphone shall be a wide-range condenser type with omnidirectional polar pattern. The microphone shall be flush mounted to prevent damage and abuse and operate on any 9V to 52V DC phantom power source. Two vandal proof steel type switches shall be mounted in the console for remote control of system Push to Talk and Page functions. The speaker shall be a 3 inch water resistant 45 ohm general purpose device with ceramic magnet and a frequency response of 150 Hz- 10K Hz. Wiring shall be a 10 foot cable pigtail with protective wrapping.
 - 1. Acceptable Manufacturers
 - a. TechWorks
- B. The Detention Grade Audio Inter-Communication System Dual Channel Audio Intercom Amplifier shall have two completely separate and discrete audio processing channels. The unit shall include all switching and logic control for push to talk (PTT) operation. An integral privacy tone shall be available and jumper selectable to alert the remote party that they are being monitored. All logic controls including Privacy Tone, Page, PTT, Mute, Activate, Shut Off, and Call Tone shall be available on the rear panel screw terminals. All logic and control connections shall be fully PLC compatible ground sensing. Microphone inputs shall be 1000 ohms balanced, -80dBm, with phantom power. The Remote Speaker Power Amplifier shall deliver 20 watts continuous power into 25 Volt loads at less than 1% total harmonic distortion. The Amplifier shall include a line output for recording all communication without custom assemblies. A separate Page line level output shall provide audio to external paging amplifiers if required. A Page Pre-Announce Tone option shall be available.
 - 1. Acceptable Manufacturers
 - a. TechWorks

- C. The Program and Paging Audio Amplifier shall be a professional quality unit with separate transformer balanced inputs for two audio sources. All switching of audio inputs shall be solid state logic controlled with static electricity protection. The amplifier shall be 1.75" High, 8.5" Wide, and 6" deep producing 40 watts at 25 Volt balanced line with less than 0.1% distortion. The input shall be industry standard 0dBm at 10K ohms and terminations shall be "Euro" style screw terminals modular connectors. The amplifier shall include Tech Works PA-BUSS interface connectors for integration with other PA-BUSS products. Products not fully compatible with Tech Works PA-BUSS technology will not be acceptable under these specifications. The power supply shall be 24 VDC 3.5 Amp universal AC source type.
1. Acceptable Manufacturers
 - a. TechWorks
- D. The Detention Grade Audio Inter-Communication System Station Switching Relays shall be low noise, double pole/double throw, sealed units with 24 Volt DC coils. Relays must be capable of being controlled from either positive or negative switching. Each relay shall have separate discrete control and have an individual LED indicator that lights whenever the relay is active. Individual station connections shall be connectorized for easy installation of field wiring. Relay panels shall be rack mount units with 16 station relays and include separate paging and intercom amplifiers connections for selectable paging input and relay control.
1. Acceptable Manufacturers
 - a. TechWorks
 - b. Econ
- E. The Detention Grade Audio Inter-Communication System Master Switching Relays shall be low noise, double pole/double throw, sealed units with 24 Volt DC coils. Relays must be capable of being controlled from either positive or negative switching. Each relay shall have separate discrete control and have an individual LED indicator that lights whenever the relay is active.
1. Acceptable Manufacturers
 - a. TechWorks
- F. The Detention Grade Audio Inter-Communication System shall be supplied with a 24-Volt Direct Current power supply capable of powering all devices, as shown on plans, simultaneously with a minimum of 25% reserve power. The power supply shall have isolated ground from DC power common and be UL/CSA Listed for use with alarm and signaling systems. A surface mounting metal bracket shall be included to house the power supply. This unit shall operate from an input of 100 to 240 Volts AC and supply a minimum of 3.75 Amps at 24-Volts DC.
1. Acceptable Manufacturers
 - a. Phoenix Contact
 - b. Sola
 - c. Power One
- G. The Detention Grade Audio Inter-Communication System Remote Intercom Speaker Station shall be a moisture resistant design employing three steel barriers and a 12 gauge stainless steel faceplate with special mounting hardware to protect it from tampering and vandalism. The integral "Call-In" switch shall be hermetically sealed and utilize a limited travel actuator to protect it from excessive force or moisture. A 25 Volt speaker shall deliver clear loud audio as both a microphone and a speaker. Stations shall be two gang or three gang as required to match existing electrical boxes. Provide two gang stations for cell areas.
1. Acceptable Manufacturers
 - a. Tech Works
 - b. Quam
- H. The ceiling mounted loudspeaker shall be a 12-inch round white ceiling panel with perforated steel grille. The ceiling speakers shall include an eight inch cone loudspeaker with one inch voice coil, a 25 volt audio transformer with taps at 6dB increments from ¼ to 5 watts, a composite fire rated enclosure, ceiling blind mounting rails, and be covered with a white epoxy finished grill. The unit shall provide a frequency response of at least 60 Hz to 17,000 Hz, ± 1.5dB with a sensitivity of at least 102dB, 5 watts, 1 meter.
1. Acceptable Manufacturers
 - a. TechWorks
 - b. Quam

- c. Lowell
- I. Weatherproof and Yard Area Paging Loudspeakers shall be double re-entrant horn, compression type loudspeaker with an integrated 16W-25V rotary select transformer and an adjustable mounting base, with a baked enamel finish. The unit shall provide average sensitivity of 110 dB SPL, 1W/ 1M, power rating of 16W RMS, frequency response of 450 Hz - 15 kHz, coverage angle of 110° included angle, -6 dB / 2 kHz, half space per EIA standard 426A. Wiring connection shall be screw terminals to a 25 transformer with rotary switch selectable taps at 16W, 8W, 4W, 2W, 1W.
 - 1. Acceptable Manufacturers
 - a. TechWorks
 - b. Quam
 - c. Lowell

2.03 SYSTEM WIRING

- A. All low voltage wiring shall be West Penn CDT or Belden.

2.04 RACKS AND ENCLOSURES

- A. The ESSC shall provide as necessary floor mounted enclosed 19" racks and/or wall mounted NEMA 1 hinged door enclosures to house control equipment. Racks manufactured by APC, Hoffmann, Lowell, Mid Atlantic, and Chatsworth are acceptable.
- B. Provide ventilation fans as required to maintain adequate airflow and recommended temperature threshold for electronic equipment.

2.05 SURGE SUPPRESSORS

- A. The ESSC shall provide surge suppressors for all electrically operated or monitored devices installed outside the building including intercom stations, paging horns, paging speakers etc.
- B. Surge suppressors manufactured by L-Com or Ditek, and rated for the proposed application will be acceptable.

2.06 UPS SYSTEMS

- A. Provide UPS backup for all electronic equipment under this section to power the connected equipment for a minimum of twenty (20) minutes under "worst case" conditions in the event of a utility power failure.
- B. UPS systems manufactured by Liebert, Tripp Lite and APC shall be acceptable.

PART 3 – EXECUTION

3.01 GENERAL

- A. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's instructions. All wiring shall be of the type and quantity recommended by the controls manufacturer, and hardware manufacturer, and approved by the local authority having jurisdiction.
 - 1. MANUFACTURER'S INSTRUCTIONS
- B. Install all equipment in accordance with the manufacturer's recommendations, and accepted shop drawings.
- C. Install all equipment in compliance with NEC requirements, NECA's "Standard of Installation" and recognized industry practices.

3.02 WIRING

- A. All wiring shall be installed in dedicated conduit throughout. Conductors routed to the individual device shall be continuous from the head end cabinet to the device.
- B. All wiring shall be clearly identified and labeled according to the device it controls. Where possible, use architectural door numbers or room numbers to identify conductors.
- C. Where conduit is routed below grade, provide cabling rated for wet locations.
- D. All equipment wiring shall be laced and fastened in place using tie wraps or equal. Cabled runs shall be straight and either parallel or perpendicular to cabinet walls.
- E. Provide adequate length of conductors. Bundle, lace and route the conductors to terminal points in a uniform fashion without excess.

- F. All signal wiring shall be shielded. Line level circuits and loudspeaker circuits shall be adequately spaced from each other and from other power circuits.
- G. Maintain separation between signal level circuits and power circuits per NEC.

3.03 EQUIPMENT ENCLOSURES

- A. Maintain 3-foot working clearances on each side of equipment or equipment racks where access is required to inspect service or adjust.
- B. All equipment cabinets, boxes, enclosures or racks shall be clearly labeled and identified. Use identifiers and abbreviations defined in the Drawings wherever possible. Use plain designation for labeling, unless indicated otherwise.
- C. Provide weatherproof enclosures for items mounted outdoors or exposed to harsh environmental conditions.
- D. Check equipment against available mounting space indicated on the drawings. Coordinate location of equipment with other devices to minimize interference. Any conflicts or clearance problems shall be brought to the attention of the Engineer.

3.04 EXAMINATION

- A. Verify that related conditions, including equipment that has been previously installed under other related sections are acceptable for product installation in accordance with manufacturer's instructions.

3.05 TESTING

- A. The system shall be installed and fully tested under the supervision of a technician, trained for the said system.
- B. Adjust audio levels for optimal audio quality and intelligibility.
- C. Set audio threshold on all cell ceiling / light fixture mounted speakers for optimal settings to prevent false activation.
- D. The system shall be demonstrated to perform all of the functions shown on the plans and as specified herein.
- E. Document all test procedures and protocols and provide a copy of test results for each system to the Engineer prior to substantial completion.

3.06 PROTECTION AND CLEANING

- A. Stored Materials and equipment excepting wire shall be stored in a controlled environment and must be protected from harmful conditions such as extreme temperature, moisture, humidity, and dirt.
- B. Repair or replace any damaged equipment or components prior to substantial completion.
- C. Remove temporary tags coverings and construction debris from interior and exterior surfaces of equipment.
- D. Clean internal air filters, grills, and fans before substantial completion.

3.07 WARRANTY

- A. See section 28 23 00 for warranty requirements.

3.08 SPARE PARTS

- A. Provide to the owner at project closeout the following spare parts:
 - 1. Provide two (2) complete spare wall mount staff stations
 - 2. Provide two (2) complete ceiling speaker assemblies

3.09 TRAINING

- A. See section 28 23 00 for training requirements.

END OF SECTION

SECTION 282340
VIDEO MANAGEMENT SYSTEM**PART 1 – GENERAL****1.01 GENERAL PRODUCT REQUIREMENTS**

- A. The software used shall be designed for enterprise level use, with an expected use period of 24/7. It shall be the Manufacturer's official software.
- B. The software shall incorporate open standards and published protocols and use standardized components.
- C. The Video Management System provider shall be defined as the provider of the video management software, and the party responsible for rigorous self-testing of the video management software prior to the release of the software.

1.02 QUALITY ASSURANCE

- A. All configurations set up, installation and integration of the software shall be done by qualified technicians who have passed a manufacturer's training program.
- B. All system components shall be from or supported by the original manufacturer.

1.03 GENERAL SYSTEMS DESCRIPTION

- A. The Video Management System shall support both centralized and decentralized configurations as well as hybrid options for architecture. Centralized management shall be available no matter the surveillance architecture. The system shall allow for integration with other security devices and products and be designed to allow for leveraging of those products to improve the user experience of the VMS .
- B. The VMS shall not require a central management server.
- C. The VMS shall make the user experience seamless to the end user irrespective of the system architecture.
- D. The VMS must be capable of each server being able to handle an unlimited number of cameras for recording.
- E. The VMS must support Windows Server 2019, 2022 and 2025 for the server side. Client- side software must be available for Windows 11, Mac OS13, iOS 18 and above, and Android. The operating system shall have all current and available patches.
- F. The VMS shall include the following without additional license fees:
 - 1. Client software for Windows.
 - 2. Client software for Mac OS13 and above.
 - 3. Client software for iOS 18 and above.
 - 4. Client software for Android-based platforms.
 - 5. Client software using a web-based interface.
 - 6. Standalone clients designed to provide fixed displays.
 - 7. Video Wall functionality.
 - 8. SmartSearch.
 - 9. Access Control Integration.
 - 10. Full Access Control software platform.
 - 11. Failover server functionality.
 - 12. A separate health monitor application.
- G. The VMS shall not require a separate application for administration and user-based roles. Limitations for non-administrative users shall be handled via permissions.
- H. The system shall support running in Virtual Servers for both the server application and client applications.

PART 2 – PRODUCTS**2.01 IP SERVER**

- A. Video storage server(s) shall be provided supporting multiple drives for the storage of video files. The storage server shall be configured in a RAID 5 configuration. Sufficient disk storage shall be provided to

accommodate video storage for all the cameras in the CCTV system with the following configuration: All cameras recorded continuously 24/7 at 7.5 images per second per camera without motion and at 15 fps on motion, with 5 seconds of pre and post motion saved, recording at native resolution, with H.265 compression, assumed activity level of 50% across all cameras and providing for 90 days of storage with 20% spare capacity. The system automatically overwrites the oldest video stored when the system storage capacity is reached (FIFO).

- B. Provide storage calculations with submittal data to demonstrate that the proposed storage solution will achieve the specified requirements.
- C. The IP Video Server shall be a RAID-5 protected, all-in-one recording, viewing and management solution for network surveillance systems.
- D. Software updates shall be available free of charge during the product warranty period.
- E. Provide a five (5) year Software Maintenance Agreement (SMA) to the owner at project closeout if the Video Management Software requires an SMA for access to technical support and / or software updates and patches.
- F. The IP Video Server shall utilize "enterprise-rated" hard drives in a fault tolerant RAID-5 configuration.
- G. The IP Video Management Server shall be sized to provide the specified storage duration for all cameras at the specified resolution and framerate. Provide storage calculations in submittal data.
- H. Functions
 - 1. The IP Video Server shall offer an energy-efficient power supply.
 - 2. The IP Video Server shall offer hot-swap hard drives.
 - 3. The Operating System of the IP Video Management Server shall run on a solid-state disk drive (SSD).
- I. Access to Video
 - 1. The IP Video Server shall deliver high-quality HD video despite low or limited bandwidth connections.
 - 2. The IP Video Management Server shall offer Dynamic Transcoding technology that retrieves data and subsequently decodes and decompresses the data stream to a lower bit stream.
 - 3. The IP Video Server shall instantly enhance the video detail to full HD quality when the video is paused.
- J. Management
 - 1. The IP Video Server shall be delivered with the VMS management application pre-configured and pre-licensed and pre-configured.
 - 2. The IP Video Server shall allow operators to use one central tool for configuration and operations management.
- K. Health Monitoring
 - 1. The IP Video Server shall provide SNMP, Remote Desktop and HTTP monitoring support.
 - 2. The IP Video Server shall offer high-availability hardware, embedded design, and system wide monitoring.
- L. Processor (minimum specifications)
 - 1. Intel Xeon E-Series 6-Core / 6-ThreadsThe IP Video Server processor shall contain two (2) sockets.
- M. Memory
 - 1. The IP Video Server shall have a minimum of 64 GB of memory installed.
- N. Electrical:
 - 1. Input: 120 VAC
 - 2. Dual redundant Power supplies
- O. Products:
 - 1. Approved manufacturers:
 - a. Dell
 - b. HP

- P. IP Server shall be designed to run on a Windows platform, supporting both Desktop and Server class operating systems including Windows 11 (Pro), Server 2019, 2022, 2025.
- Q. It shall run as a Window's Service. This service shall run as part of the local service account. This service shall be running as long as the system is booted and has started Windows. It shall not require the user to be logged in.
- R. It shall store settings in SQL Express and shall not require a full MS-SQL license.
- S. It shall have an option for a 32-bit binary and a true 64-bit binary. In a 64-bit OS, it shall run as a native 64-bit application, not merely a 32-bit application.
- T. The service shall connect to the camera and handle streaming to the server. It shall not require each client to connect to individual cameras.
- U. This service shall allow the cameras to be placed on one network and the clients on a separate network using a different IP range.
- V. The software shall support the ONVIF standard.
- W. The software shall support Megapixel virtual cameras within a single camera license.
- X. The server shall only require two ports for streaming video as well as handling any setting changes or commands from the client software.
- Y. IP Server shall record the video streams from different cameras.
 - 1. The service shall handle transcoding of the camera streams if the cameras are MJPEG based. The video shall be re-encoded to WMV to reduce storage needs and to reduce the impact of streams to clients on the server.
 - 2. For MPEG-4 based cameras, the video shall be stored in the native codec of the server.
 - 3. For H.264/H.265 based cameras the video shall be stored in the native codec of the server.
 - 4. Each camera will have the option to be able to be stored in different locations (i.e. One locally, another on a NAS, a third on a different network share).
 - 5. Streaming from server to client shall support H.264/H.265.
 - 6. The server must have Pivot 3 integration.
- Z. IP Server shall support H.264/H.265, MPEG-4, MJPEG and MXPEG based cameras.
- AA. IP Server shall support motion detection at the camera and at the software levels.
- BB. IP Server shall provide graphic examples of what it determines as motion to thick clients if the thick client requests it.
 - 1. The software shall display the motion detection as an outline around the area moving.
 - 2. The software shall provide a bar showing the total percentage of change. This bar shall have a slider on it to allow the user to quickly set motion detection.
- CC. IP Server shall allow for multiple zones to be set within an image that support differing motion detection values within a cameras field of view.
 - 1. There shall be no limit on the total number of zones allowed, either on a per camera or per server basis.
 - 2. Zones should allow the ability to ignore motion within an area.
 - 3. The user shall have the ability to move the zones after the fact.
 - 4. Motion zones should be able to be tied into a rules engine to allow the software to use them as triggers for events.
- DD. IP Server shall support the use of imported maps to show camera placement. These formats for these maps will be JPG, GIF or BMP as determined by the user.
 - 1. Hovering over a camera on a map shall cause it to be displayed in a window on the side.
 - 2. When the camera is displayed on the side, the option to review recently recorded video will be available to them.
 - 3. The user shall be able to embed layouts onto the facility map. Clicking on the layout shall change the display of the client software.
 - 4. Alarms from DIOs shall be able to be embedded as well.
 - 5. Audio sources shall also be an option.

6. Other facility maps shall also be an option to embed. Clicking on a different embedded map shall bring up that map.
 7. Doors from certain access control systems can be imported and displayed. Hovering over the door shall display the last badge used to badge in, a live view of the camera associated with the door. The user from this pop up shall be able to see badge events and alarm events along with the associated video.
- EE. IP Server shall not require the administrator to contact the manufacturer to replace a camera.
- FF. IP Server shall support reporting to a diagnostic tool.
1. Number of active cameras.
 2. Active cameras offline.
 3. Version of the server.
 4. Amount of disk space left.
 5. Recording status of the server.
- GG. IP Server shall support pre-motion and post motion recording.
- HH. IP Server shall support customizable layouts. The layouts will allow for blank spaces within the layout.
- II. IP Server shall support an unlimited number of users.
1. Users can be drawn from either an Active Directory server, Novell eDirectory or entered manually.
 2. There will be five different levels of user.
 3. Users can be members of a group with settings set for the group. Individual user settings can override the group settings.
 4. Permissions can be set for live viewing, access to recorded video, control of PTZ cameras, access to audio, the ability to export video, custom layouts, facility maps and rules. Permissions can be defined on a per camera basis.
 5. It shall support the option of having the users limited to being signed in to a single location.
- JJ. IP Server will include a diagnostic version with limited interface, to allow for testing of the server.
- KK. It shall support an optional secondary server with failover capacity.
- LL. A rules engine shall be included to allow the server to handle more complex tasks.
1. Triggers will include:
 - a. Dry contacts (DIO).
 - b. Motion detection of a camera stream.
 - c. Scheduled events. Events can be scheduled on daily, weekly, or monthly basis. Individual events can be handled as well.
 - d. An Alert button for the user interaction in the VI Monitor.
 - e. Inputs sent programmatically via appropriate APIs.
 - f. Access control events from supported Access Control Vendors.
 2. Actions will include:
 - a. Logging the event.
 - b. Opening or closing a dry contact.
 - c. Sending an e-mail with a custom text message tied to the trigger. Multiple texts will be allowed for different triggers.
 - d. Sending an e-mail with an AVI/MP4 clip from a selected camera.
 - e. Sending an e-mail with a JPG file of a selected event from a camera.
 - f. Opening a live window for a user who is viewing.
 - g. Move a PTZ to a certain preset location.
 - h. Force recording.
 - i. Force recording with audio.
 - j. Instant Replay.
 - k. Sending video to a Network Decoder.
 - l. Switching single camera or layout views.
 - m. Message Instruction.
 - n. Moving, copying or deleting of files.
 - o. Execute a program or batch file.

- p. Send an ASCII string to a TCP port.
- q. IP Server shall support time out functionality.
- r. A universal RTSP option shall exist for adding cameras if they are not currently supported through native APIs.
- s. PTZ functionality within the camera will be supported.
- 3. Dewarping of Panoramic shall be supported for the following manufacturers:
 - a. Advidia
 - b. AMG
 - c. Axis
 - d. Dahua
 - e. Hikvision
 - f. Oncam
 - g. Pelco
 - h. Panasonic
 - i. Sentry 360
 - j. Uniview
 - k. Vivotek
 - l. Dlink
 - m. Dynacolor
 - n. EverForcus
 - o. GridSmart
 - p. IDIS
 - q. ACTi
 - r. GeoVision
 - s. Hanwha
 - t. Samsung
 - u. ImmerVision

MM. IP Server will only stream video to the clients that requested them.

NN. If live video is paused, then IP Server shall stop streaming video to the clients to conserve bandwidth.

OO. IP Server shall support integration with various access control platforms, including:

- 1. Imron
- 2. MonitorCast v.3
- 3. MonitorCast v.4
- 4. AMAG
- 5. Badge Pass
- 6. Blackboard
- 7. Continental
- 8. Infinias
- 9. Isonas
- 10. Lenel
- 11. Paxton
- 12. CCURE
- 13. DSX
- 14. Gallagher
- 15. Maxxess
- 16. RBH
- 17. S2
- 18. Sureview

PP. With Isonas, MonitorCast v.4 and Paxton, IP Server shall allow for importing the doors from those systems and respond to events in the VMS software along with basic door control.

QQ. IP Server shall have support panic button functionality through rules engine.

2.02 VI MONITORPLUS

- A. VI MonitorPlus will be a thick client for viewing live and recorded video, along with handling administrative tasks.
- B. The software shall not require a client license to operate.
- C. The thick client will support an encrypted XML file for storing settings. The file can be set up to be shared between many clients, allowing the administrator to update all clients with a single file push.
- D. Clients will be able to use Active Directory to authenticate users.
- E. Clients will be able to use Novell E-directory to authenticate users.
- F. VI MonitorPlus shall have a searchable timeline for multiple events.
 - 1. Motion.
 - 2. Access Control (integration required).
 - 3. Rules.
 - 4. LPR (License Plate Recognition).
 - 5. VCA (Video Content Analytic).
- G. VI MonitorPlus will display the servers it's connected to along with the server's cameras in a tree view on the left-hand side.
 - 1. The tree view will allow the user to see the status of the servers that the instance of VI MonitorPlus is aware of.
 - 2. The tree view will also include access to custom layouts, facility maps and action buttons.
 - 3. There will be an option to hide the tree on startup of VI MonitorPlus.
 - 4. The user shall be able search for cameras using a searchable box on the left-hand tree.
 - 5. The thick client will not be limited in the number of servers it can connect to.
 - 6. Live view will allow views of 1, 2, 4, 8, 9, 10, 13, 16, 25 and 36 cameras. A widescreen option for 18 and 24 cameras will also be available.
 - a. Layouts will be selectable via icon.
 - b. Layouts will not be limited to cameras from a single server.
 - c. Users will be able to get layouts to cycle in the client's workspaces.
 - d. Layouts shall be able to be put into groups.
- H. If motion is detected on a camera, the software shall have the option to indicate it by highlighting the edge of the live window.
- I. Live view will allow cameras to be dragged and dropped onto the live view from the left-hand tree. Cameras can be duplicated in a view.
- J. Users will be able to invoke a digital zoom by drawing a box.
- K. After invoking the digital zoom, VI MonitorPlus shall support the use of picture in picture within the zoomed image.
- L. Digitally zoomed areas will be treated as a digital PTZ.
- M. PTZ Presets shall be listed in a drop-down menu in the Dynamic Tab.
- N. Users shall be able to move the PTZ movements simply by clicking on the image, through onscreen PTZ controls. Zoom functionality can also be controlled via the scroll wheel of the mouse.
- O. Live view will support a full screen mode that hides the UI. User shall be able to start VI MonitorPlus in this full screen mode with a setting.
- P. Live view shall allow the user to de-warp the video from panoramic lenses and cameras.
- Q. Right clicking on a camera in live view will have the following behaviors:
 - a. Right clicking on a camera within live view will allow the user to be able to review the recently recorded video for that camera.
 - b. Right clicking on a camera within live view will also allow access to the properties dialog box for that camera.
 - c. Right clicking on a camera will bring up the option to save a still image of the live view.
 - d. Live audio will be able to be accessed by right clicking on a camera in the live view.

- e. Allowing access to recorded video.
 - f. Right-clicking on the Camera tile will allow the users to send video or messages to other users in the form of a popup window.
- R. Recorded video Synchronized playback will allow for cameras to simply be dragged and dropped into the player.
- S. The exporting of video in VI MonitorPlus shall have Region of Interest capability within a recorded image. This will enable segregation of image for export.
- T. The thick client will include a repair utility for corrupted video.
- U. VI MonitorPlus will be able to display logging information such as: changes to the server, lost camera signals, who exported recorded video, when did users log-on/off and other errors. This functionality will be limited to administrative users. The log will be exportable as txt or to the Windows clipboard.
- V. VI MonitorPlus shall also provide real time status updates for server status and camera status, including the CPU usage, disk usage, bandwidth usage, licensing and number and names of users who are logged in.
- W. The system will support an Alarm Log to make it easier to find DIO based events.
- X. Facility maps will be available in the software for viewing.
 - 1. When the user hovers over a camera in the facility map it will display the camera in a window off the side of the map.
 - 2. While a camera is displayed it will allow access to recorded video from that camera as well as the live stream.
 - 3. Cameras will display where they are pointed.
 - 4. Embedded layouts will change the layout of VI MonitorPlus if they are clicked on.
 - 5. Embedded Facility maps will cause the current map to change to the embedded map if clicked on.
 - 6. The user will have the option of importing and placing doors from supported access control partners on the map. This shall allow them to see badge events as well as alarm events. It shall also support the ability to lock and unlock doors from the map.
 - 7. Integrated Panic button events will be visible on the facility map.
- Y. VI MonitorPlus will support the DCZ Joystick as well as standard USB joysticks.
- Z. The software shall support the ability to open a live window that can be moved around. This window will be able to access the view of any camera or layout the user has access to.
- AA. VI MonitorPlus will support multiple screen user environments for dynamic user interface.
- BB. The user will be able to enable or disable the following settings:
 - 1. Server name in the live view.
 - 2. Camera Name in the live view.
 - 3. Audio notification on motion.
 - 4. Forcing aspect ratio.
 - 5. Use Direct Show for display.
 - 6. Double clicking to change the server layout.
 - 7. Double clicking expands the camera.
 - 8. Allowing multiple live windows.
 - 9. Block live windows from popping up.
 - 10. Live window always on top.
 - 11. The speed in which layouts cycle.
 - 12. Hiding left tree on start up.
 - 13. Launching Facility maps on start up.
- CC. Users with Administrator privileges will be able to configure the server and camera settings. Users will also be able to test SMTP settings and database settings.
 - 1. Users will be able to configure the framerate of the camera, including the option to have the server record continuously from 1 to 3 fps with the option to go to the cameras designated frame rate on motion detection.
 - 2. Users will be able to select various time-lapse options for the camera.

3. Users will be able to select the camera stream type.
 4. Users will be able to select camera or server-side motion detection.
 5. Users will be able to access a graphic representation of what the server's motion detection settings are
 6. picking up through the timeline.
 7. Users will be able to configure user settings as well as layout settings from within the thick client.
- DD. VI MonitorPlus will allow users to send video to other users, allowing for remote live pop ups of video of important events.
- EE. VI MonitorPlus will support Layout touring. Selecting a layout will cycle through a list of cameras.
- FF. User shall be able to allow for remote support via VI MonitorPlus.
- GG. VI MonitorPlus will allow Region of Interest searches (a.k.a. SmartSearch functionality).

2.03 WEB CLIENT

- A. The Web Client shall be a thin client, using either an active-x control or an MJPEG streaming method.
- B. It shall support IE, Firefox, Safari, Chrome and Opera.
- C. It will not be limited to Windows platforms only.
- D. It will not require a license.
- E. Users will not be able to change any settings within IP Server via the thin client without Admin privileged.
- F. Users will be able to select layouts for live viewing, or individual cameras or groups of cameras.
- G. Users will be able to access recorded video.
- H. Users will be able to download recorded video from the system.
- I. Users will be able to use the motion log to find recorded video.
- J. The Web Client shall support the use of facility maps.
- K. The Web Client will support the use of custom layouts.
- L. The Web Client will use IIS as its web server.
- M. The Web Client shall allow remote access for iPhone, Blackberry, Windows Mobile, and Android mobile phones without the installation of an app.

2.04 HEALTH MONITOR

- A. Health Monitor will listen for reports given by the service as to its status.
- B. If Health Monitor detects anything abnormal, it will give a visual display through a web front end, or by sending out an e-mail to one or more users.
- C. It will be hosted locally or across the internet.
- D. It shall run as a service.

2.05 VIDEO WALL

- A. Video Wall shall support an unlimited number of monitors.
- B. Video Wall shall support up to four monitors per workstation.
- C. The user shall be able to select the display of Video Wall via the VI Monitor.
- D. No license shall be required for Video Wall.

2.06 OS APP

- A. The iPhone/iPad application shall not require a license to operate.
- B. The App will have access to live cameras.
- C. PTZ functionality will be available in the App.
- D. The App will have access to recorded video.
- E. Facility map functionality will be available.

- F. Snapshots will be able to be e-mailed from the App.

2.07 ANDROID APP

- A. The Android application shall not require a license to operate.
- B. The App will have access to live cameras.
- C. PTZ functionality will be available in the App.
- D. The App will have access to recorded video.
- E. Facility map functionality will be available.

2.08 OUTDOOR CAMERAS

- A. Outdoor single sensor dome camera – iPRO WV-S25500-F6L
- B. Outdoor dual sensor camera – iPRO WV-S85402-V2L
- C. Outdoor 3 sensor camera – iPRO WV-S8543L

2.09 INDOOR CAMERAS

- A. Indoor single sensor dome camera – iPRO WV-U22550-F3L
- B. Indoor single sensor corner mount anti-ligature camera - WV-X25580-F2LN2
- C. Indoor dual sensor camera – iPRO - WV-S85402-V2L
- D. Indoor 3 sensor camera – iPRO WV-S8543L
- E. Indoor 4 sensor camera – iPRO WV-S8544L

PART 3 – EXECUTION

3.01 GENERAL

- A. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's instructions. All wiring shall be of the type and quantity recommended by the controls manufacturer, and hardware manufacturer, and approved by the local authority having jurisdiction.

3.02 MANUFACTURER'S INSTRUCTIONS

- A. Install all equipment in accordance with the manufacturer's recommendations and accepted shop drawings.
- B. Install all equipment in compliance with NEC requirements, NECA's "Standard of Installation" and recognized industry practices.

3.03 WIRING

- A. All wiring shall be installed in dedicated conduit throughout. Conductors routed to the individual device shall be continuous from the head end cabinet to the device.
- B. All wiring shall be clearly identified and labeled according to the device it controls. Where possible, use architectural door numbers or room numbers to identify conductors.
- C. Where conduit is routed below grade, provide cabling rated for wet locations.
- D. All equipment wiring shall be laced and fastened in place using tie wraps or equal. Cabled runs shall be straight and either parallel or perpendicular to cabinet walls.
- E. Provide adequate length of conductors. Bundle, lace and route the conductors to terminal points in a uniform fashion without excess.
- F. All signal wiring shall be shielded. Line level circuits and loudspeaker circuits shall be adequately spaced from each other and from other power circuits.
- G. Maintain separation between signal level circuits and power circuits per NEC.

3.04 EQUIPMENT ENCLOSURES

- A. Maintain 3-foot working clearances on each side of equipment or equipment racks where access is required to inspect service or adjust.

- B. All equipment cabinets, boxes, enclosures or racks shall be clearly labeled and identified. Use identifiers and abbreviations defined in the Drawings wherever possible. Use plain designation for labeling, unless indicated otherwise.
- C. Provide weatherproof enclosures for items mounted outdoors or exposed to harsh environmental conditions.
- D. Check equipment against available mounting space indicated on the drawings. Coordinate location of equipment with other devices to minimize interference. Any conflicts or clearance problems shall be brought to the attention of the Engineer.

3.05 EXAMINATION

- A. Verify that related conditions, including equipment that has been previously installed under other related sections are acceptable for product installation in accordance with manufacturer's instructions.

3.06 TESTING

- A. The system shall be installed and fully tested under the supervision of a technician, trained for the said system.
- B. Adjust audio levels for optimal audio quality and intelligibility.
- C. Set audio threshold on all cell ceiling / light fixture mounted speakers for optimal settings to prevent false activation.
- D. The system shall be demonstrated to perform all of the functions shown on the plans and as specified herein.
- E. Document all test procedures and protocols and provide a copy of test results for each system to the Engineer prior to substantial completion.

3.07 PROTECTION AND CLEANING

- A. Stored Materials and equipment excepting wire shall be stored in a controlled environment and must be protected from harmful conditions such as extreme temperature, moisture, humidity, and dirt.
- B. Repair or replace any damaged equipment or components prior to substantial completion.
- C. Remove temporary tags coverings and construction debris from interior and exterior surfaces of equipment.
- D. Clean internal air filters, grills, and fans before substantial completion.

3.08 WARRANTY

- A. See section 28 23 00 for warranty requirements.

3.09 SPARE PARTS

- A. Provide to the owner at project closeout the following spare parts:
 - 1. Provide one (1) spare camera of each type installed

3.10 TRAINING

- A. See section 28 23 00 for training requirements.

END OF SECTION

**SECTION 282350
ACCESS CONTROL SYSTEM****PART 1 – GENERAL****1.01 GENERAL REQUIREMENTS**

- A. The security management system shall be deployed through IP network infrastructure with a two- tiered hardware hierarchy. The IP Door Controller shall be capable of running on an existing TCP/IP network and shall be accessible, configurable, and manageable from any network-connected PC with a browser.
- B. Browser access for configuration and administration of the system shall be possible from a PC on the same subnet, through routers and gateways from other subnets, and from the Internet. Control and management of the system shall therefore be geographically independent.
- C. The top hardware tier shall be the MonitorCast v8 Server based platform. Installed applications on the MonitorCast v8 Server is to be an operating system, a web MonitorCast v8 Server, security application software, and the database of personnel and system activity.
- D. The bottom hardware tier shall be the IP Door Controller. The IP Door Controller shall make and manage access control decisions with data provided by the MonitorCast v8 Server, and it shall control the communication between the IP Door Controller and door hardware connected to the IP Door Controller inputs, outputs, and readers. This modular design shall make it possible for the system to continue to manage access control and store system activity logs, even during network downtime. When network connectivity is re-established, the system activity logs shall be automatically re-integrated to the host MonitorCast v8 server.
- E. The system shall integrate within a browser interface, access control and video monitoring. These applications shall be a fully bi-directional integrated software architecture.
- F. The database tier shall use Microsoft SQL Server residing on the MonitorCast v8 Server. Microsoft SQL Server on the MonitorCast v8 Server shall be a full featured, high performance database management system. This shall provide a small footprint, low administration, and a high reliability relational database that is embedded without requiring the use of a separate PC MonitorCast v8 Server.
- G. The MonitorCast v8 Server tier shall be based on a Microsoft™ MonitorCast v8 Server 2022 or 2025 MonitorCast v8 Server. This application shall provide a graphically rich security management application through a standard web browser.
- H. All equipment and materials used shall be standard components, regularly manufactured, and regularly utilized in the manufacturer's system.
- I. All systems and components shall have been thoroughly tested and proven in actual use.
- J. All systems and components shall be provided with a manufacturer warranty of one year for software and two years for hardware.

1.02 OVERALL SYSTEM CAPABILITY

- A. The security management system shall meet the requirements of business and government access control systems. The system shall monitor and control facility access and shall perform alarm monitoring and integration to camera and video monitoring. The system shall also maintain a database of system activity, personnel access control information, and system user passwords and user role permissions. The system shall be controlled from a web browser and require no software installation or client licenses. The system shall provide control and access to users on Local Area Networks (LAN), Wide Area Networks (WAN), wireless networks, and the Internet. The system shall provide email and/or text message alerts for all alarm conditions and threats.
- B. System Partitioning: The system administrator shall have the ability to divide the system into partitions, allowing subsets of the overall population and/or resources to be managed separately.
 - 1. From the default Master partition, one or more additional partitions shall be able to be created.
 - 2. Each partition shall contain some number of administrators, card holders with their credentials, and resources.
 - 3. When performing administrative functions, the administrator of a partition shall have the ability to create or modify only the cardholders and resources in that partition. However, resources shall be

- able to be shared across partitions through the mapping of access levels from one partition to another.
4. System partitioning shall have a precision feature that allows administrators in one or more partitions to view and perform edit functions on person records that belong to another partition.
 5. Administrators shall have the ability to search for person records across all partitions to which they have access. The system administrator shall have the ability to make such cross- partition searches the default for users who have access to multiple partitions.
 6. After finding a personnel group record located in another partition, an administrator shall be able to click a button to switch to that partition directly from the personnel group record—and possibly edit the record, depending on his or her access rights in that partition. Alternatively, an option for making every person record seamlessly visible across all partitions shall be provided.
- C. The system shall provide the following Access Control capabilities:
1. Integrated photo ID creation capability with video verification.
 2. User interface secured access under encrypted password control.
 3. Multiple Site Control.
 4. System-wide timed anti-pass back function.
 5. “First-in-unlock” rule enforcement.
 6. Multiple access levels and cards per person.
 7. Detailed time specifications.
 8. Simultaneous support for multiple card data formats.
 9. Compatibility with various input devices, including biometric readers.
 10. Activation/expiration date/time by person with one-minute resolution.
 11. Access level disable for immediate lockdown.
 12. Multiple holiday schedules.
 13. Timed unlock schedules.
 14. Dual-reader portal support.
 15. Wiegand Reader support.
 16. Magnetic-stripe reader support.
 17. Wiegand keypad PIN support for 4-digit or 6-digit PINs.
- D. D. The system shall provide the following native or VMS integrated monitoring capabilities:
1. The Home page shall allow users to view a full system summary, including an Activity Log, Auto-Monitor, and dashboard functions.
 2. Common alarm panel integration for disarm on access, and arm on egress.
 3. Integrated real-time IP-based NVR systems with stored video replay for events.
 4. Provides alarms on communication loss.
 5. Provides the ability to record video and link to video for alarm events.
 6. A monitoring desktop that integrates video, system activity logs, floorplans, ID photos, and alarm notifications.
 7. Graphic floorplans with active icons of monitor and access control points.
 8. Secure access to the user interface under encrypted password control.
 9. Delivery of alerts via VMS Rules Manager or Automation and email.
 10. Remote logging of system messages to local host.
- E. The system shall provide the following integrated VMS Video Management capabilities:
1. Playback of event-related video.
 2. Integrated alarm inputs from the video management system.
 3. Digital playback of video events.
 4. Linking of video and events based on triggers provided by the system or video system.
 5. Support for multiple NVRs.
 6. Multiple pre-programmed supported cameras.
 7. Monitoring and control through a web browser interface.
- F. The system shall provide the following Security Database capabilities:
1. Maintain data of system activity, personnel access control information, system user passwords and custom user role permissions for whole or partial access to system resources and data.

2. LDAP integration for single-user logon authentication.
3. Network-secure API for external application integration.
4. Easy to use custom report generator.
5. Record recall by vehicle tag, name, or card.
6. An API for adding to, deleting from, and modifying the database.
7. Storage of system user passwords and permissions.
8. Storage and recall of ID photos and emergency personal information.
9. Pre-defined reports on system configuration, system activity history, and people.
10. Custom report writer interface that allows the interactive creation of custom reports. Reports may be saved for later reuse. No third-party software (such as Crystal Reports) shall be necessary.
11. Selectable custom report output formats, including PDF & CSV.
12. Custom report repository location. Users shall be able to review, cancel and delete reports from this data storage location.
13. Email and text messaging (SMS) alert notifications.

PART 2 – PRODUCTS

2.01 HARDWARE REQUIREMENTS

- A. The security management system shall employ a modular hardware concept that enables simple system expansion and utilizes a two-tiered hardware hierarchy:
 1. At the top tier shall be a MonitorCast v8 Server, which shall contain the database engine, web MonitorCast v8 Server, application software, and configuration data. It is at this level that System Users, through a browser interface, shall interact with the system, set configurations, monitor activities, run reports, and manage alarms.
 2. At the bottom tier shall be the IP Door Controller, an intelligent device with native TCP/IP & PoE support, which shall make and manage access control decisions, a set of inputs, outputs and readers.
 3. The network device shall run on existing building TCP/IP PoE networks and shall be configurable for access from separate subnets, through gateways and routers, and from the Internet.
- B. A MonitorCast v8 Server shall contain a processor, flash memory, and storage. External battery backup shall be used to provide uninterrupted operation in the event of external power loss. The IP Door Controller shall contain IIS for communication with the IP Door Controllers and a network interface port. A MonitorCast v8 Server shall have the following capabilities:
 1. Door Controller: (Mercury EP/LP boards) (AD-400/AD-300 Wireless locks): 512
 2. Access cards: No Limit
 3. Card formats: 15 per Controller
 4. Alarm input points: 2,048 per Controller
 5. Control point outputs: 2,048 per Controller
 6. Ethernet ports: 1
 7. Time specifications: 512 per Controller
 8. Holidays: 255 per Controller
 9. Access levels per person: 15 per person (32,000 per Controller)
 10. Cards per person: No Limit
 11. Concurrent system users: Unlimited
- C. The IP Door Controller shall make and manage access control decisions with data provided by the MonitorCast v8 Server, and it shall manage the communication between the IP Door Controller connected to the system's inputs, outputs, and readers. The IP Door Controller shall be powered with PoE power input 12.95 W (802.3af or 12V DC 900mA power supply) protocol. Each IP Door Controller shall have the following capabilities:
 1. Access control doors: 1
 2. Readers: 2
 3. Supervised Inputs: 2
 4. General Input: 2
 5. Relay Outputs: 2
 6. Connectivity: 10/100 Ethernet

7. Credential storage: 20,000
 8. Activity Log records: 27,000
- D. The IP Door Sub-Controller single door shall make and manage access control decisions with data provided by the MonitorCast v8 Server through the IP Door Sub-Controller, and it shall manage the communication between the IP Door Sub-Controller connected to the system's inputs, outputs, and readers. The IP Door Controller shall be powered with PoE power input 12.95 W (802.3af or 12V DC 900mA power supply) protocol. Each IP Door Controller shall have the following capabilities:
1. Access control doors: 1
 2. Readers: 1
 3. Supervised Input: 4
 4. Relay Outputs: 2
 5. Connectivity: 10/100 Ethernet
- E. The Door Sub-Controller single door shall make and manage access control decisions with data provided by the MonitorCast v8 Server through the IP Door Controller, and it shall manage the communication between the IP Door Sub-Controller connected to the system's inputs, outputs, and readers. The IP Door Sub-Controller shall be connected to IP Door Controller using RS-485 protocol. Each IP Door Sub-Controller shall have the following capabilities:
1. Access control doors: 1
 2. Readers: 1
 3. General Input: 2 (programmable)
 4. Dedicated Input: 1
 5. Relay Outputs: 2
 6. Connectivity: RS-485
- F. The Door Sub-Controller two door shall make and manage access control decisions with data provided by the MonitorCast v8 Server through the IP Door Controller, and it shall manage the communication between the IP Door Sub-Controller connected to the system's inputs, outputs and readers. The IP Door Sub-Controller shall be connected to IP Door Controller using RS-485 protocol. Each IP Door Sub-Controller shall have the following capabilities:
1. Access control doors: 2
 2. Readers: 1
 3. General Input: 8 (programmable)
 4. Dedicated Input: 2
 5. Relay Outputs: 6
 6. Connectivity: RS-485
- G. The Serial Input Sub-Controller shall make and manage access control decisions with data provided by the MonitorCast v8 Server through the IP Door Controller, and it shall manage the communication between the IP Serial Input Sub-Controller connected to the system's inputs and outputs. The IP Serial Input Sub-Controller shall be connected to IP Door Controller using RS-485 protocol. Each IP Serial Input Sub-Controller shall have the following capabilities:
1. General Input: 16 (programmable)
 2. Dedicated Input: 2
 3. Relay Outputs: 2
 4. Connectivity: RS-485
- H. The Serial Output Sub-Controller shall make and manage access control decisions with data provided by the MonitorCast v8 Server through the IP Door Controller, and it shall manage the communication between the IP Serial Output Sub-Controller connected to the system's inputs & outputs. The IP Serial Output Sub-Controller shall be connected to IP Door Controller using RS-485 protocol. Each IP Serial Output Sub-Controller shall have the following capabilities:
1. General Output : 16
 2. Dedicated Inputs: 2
 3. Connectivity: RS-485

2.02 READERS

- A. Credential readers shall support the following 13.56 MHz contactless smart cards:
 - 1. Seos®
 - 2. iCLASS SE™
 - 3. iCLASS®
 - 4. MIFARE DESFire®
 - 5. EV1/EV2/EV3
 - 6. MIFARE® Classic.
- B. Credential readers shall support the following 125 kHz contactless cards.
 - 1. HID Prox®
 - 2. Indala® Prox
 - 3. Dorado® Prox
 - 4. EM Prox legacy contactless credentials
- C. Credential readers shall support Open Supervised Device Protocol (OSDP) Wiegand
- D. Switch plate size readers shall be HID Signo 40
- E. Mullion Mount readers shall be HID Signo 20

2.03 HARDWARE PACKAGING REQUIREMENTS

- A. The security management system shall have various hardware enclosures and configurations available to support different installation requirements. Enclosures shall be available for wall or rack mounting. The wall-mount enclosures shall have a lock requiring a key.

2.04 MONITORCAST V8 SERVER AND IP DOOR CONTROLLER SPECIFICATIONS

- A. The MonitorCast v8 Server shall be powered by platinum efficiency hot plug redundant 495 W or 750 W power supply.
 - 1. OS: Windows Server 2022 / 2025
 - 2. Storage: 200 GB (minimum)
 - 3. Processor: Intel I7 class processor or higher
 - 4. RAM: 32 GB
 - 5. Ethernet Ports: 2
 - 6. Warranty: 3 Years
- B. Each IP Door Controller shall be powered by PoE in accordance with IEEE 802.3af standard. With PoE as the power source the total power available for all external outputs is 12V DC @ 650mA. IP Door Controllers shall have the following characteristics:
 - 1. TTL reader connectors: 2
 - 2. RS-485 reader connectors: 1
 - 3. Power available for output: 650 milliamps
 - 4. Input connectors: 2
 - 5. Output connections: 2
- C. Each IP Door Sub-Controller shall be powered by PoE in accordance with IEEE 802.3af standard. With PoE as the power source the total power available for all external 12V. IP Door Controllers shall have the following characteristics:
 - 1. TTL reader connectors: 1
 - 2. Power available to readers: 150 milliamps
 - 3. Input connectors: 4
 - 4. Output connections: 2
- D. Each Single Door Sub-Controller shall be powered by may be supplied with 12-24V DC at 3 amps. With a 12V DC 3A power supply the total power available for all external output shall be 1100mA (13 watts). IP Door Controllers shall have the following characteristics:
 - 1. TTL reader connectors: 1
 - 2. Power available to readers: 150 milliamps
 - 3. Input connectors: 3

4. Output connections: 2
5. Communication protocol: RS-485
- E. Each Two Door Sub-Controller shall be powered by may be supplied with 12-24V DC at 3 amps. With a 12V DC 3A power supply the total power available for all external output shall be 1100mA (13 watts). IP Door Controllers shall have the following characteristics:
 1. TTL reader connectors: 2
 2. Power available to readers: 150 milliamps
 3. Input connectors: 10
 4. Output connections: 6
 5. Communication protocol: RS-485
- F. Each Serial Input Sub-Controller shall be powered by may be supplied with 12-24V DC at 3 amps. With a 12V DC 3A power supply the total power available for all external output shall be 1100mA (13 watts). IP Door Controllers shall have the following characteristics:
 1. General Input connectors: 16
 2. Dedicated Input connectors: 2
 3. Output connections: 2
 4. Communication protocol: RS-485
- G. Each Serial Output Sub-Controller shall be powered by may be supplied with 12-24V DC at 3 amps. With a 12V DC 3A power supply the total power available for all external output shall be 1100mA (13 watts). IP Door Controllers shall have the following characteristics:
 1. General Output connectors: 16
 2. Input connections: 2
 3. Communication protocol: RS-485

2.05 SOFTWARE REQUIREMENTS

- A. Operating System and Application Software shall have the following characteristics:
 1. The MonitorCast v8 Server operating system shall be Windows Server 2022 or Windows Server 2025 operating system.
 2. The system database shall be SQL Server Express requiring a small footprint and providing high reliability. The MonitorCast v8 Server shall provide users with access and operate the system using a standard web browser.
 3. The system shall support the following web browsers:
 - a. For the security management system, the listed browsers shall include Microsoft Edge, Firefox, Chrome and Safari.
- B. Software Licensing shall have the following characteristics:
 1. Software licensing shall be based upon the number of cameras licenses you have per server and individual lifetime licensing in situations where doors out number cameras at the project site.
 2. Licensing shall be controlled by a Serial Key and an Activation Code. The Serial Key shall contain the licensed system limits. System upgrade licensing to enable more cameras or more doors shall require a Serial Key re-activation. The key shall be locked to the system license number.
- C. Software upgrades shall be possible from a browser on any network-connected PC, by uploading a software update to the IP Door Controller. No client software installation shall be necessary.
- D. Online Help and Documentation - The system shall be provided with complete online documentation. The online documentation shall include:
 1. Technical Support Notes - These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.
 2. Installation Guides - These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.
 3. Video Integration Guides - These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.
 4. End-User Task Guide - This document shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.

- E. Language Support - The system shall be provided with multiple language support. The ability to switch from one language to another shall be accomplished through the user interface. Translation of the user interface, online help and documentation into other languages shall be available. The languages supported shall include:
 - 1. English
 - 2. Date Formats - The system shall support global date formats as follows:
 - 3. mm/dd/yyyy
 - 4. dd/mm/yyyy
 - 5. yyyy/mm/dd
- F. Floor plans - The system shall provide graphic floor plan capability including graphic display of door status and entry direction. Floor plans shall have the following characteristics:
- G. The Network Administrator shall be able to graphically configure device icons onto the floorplan images, and to upload additional floorplan images. JPEG images shall be supported, and the maximum size for a floorplan image shall be 256K.
- H. Personnel Data - The system shall maintain person data relating to access control, system user privileges, photo identification, system activity, and contact information.
 - 1. All person data in the system shall be integrated onto one page for viewing, editing, and deletion by system users.
 - 2. A system user holding at least an "Administrator" user role shall be able to create, delete, and modify person records, including access levels, schedules & resource groups.
 - 3. A system user holding at least a "Administrator" user role shall be able to configure the display of person records.
- I. Access Control:
 - 1. The system shall be able to make access control decisions, define a variety of access levels and time specifications, write system activity into a log file, maintain a personnel enrollment database, receive signals from input devices such as door switch monitors, card readers and motion detectors, energize devices such as door locks and alarms via outputs.
 - 2. Card Formats - The system shall support the use of readers that use the Wiegand Reader Interface. The system shall also support the use of the Magnetic Stripe ABA track 2 card data formats.
 - 3. It shall be possible to create new card formats, designate start bits and bit lengths for facility codes and card ID numbers, as well as designate parity bits. The system shall support up to 32 different card formats.
 - 4. Access Levels - The system shall be capable of storing unlimited access levels in each partition.
 - 5. The definition of an access level shall require the assignment of a reader or reader group, and a time specification.
 - 6. First-in Unlock Rule - The system shall support the use of a First-in unlock rule. It shall be possible to use this rule to control the unlock behavior of portal groups with assigned unlock time specs.
 - 7. The First-in unlock rule shall require a card read of a specified access level. The portals in the group shall unlock only when the rule is satisfied and the unlock time spec is valid.
 - 8. Holidays - The system shall be capable of storing up to 5 holidays per system. Each holiday shall be assigned a unique alphanumeric name. The definition of a holiday shall require a start date and an end date. Holidays shall have the ability to span several days using only one holiday slot. Holiday definitions shall support the designation of a start time and an end time. If no start time is designated, then the system shall default to 00:00 (start-of-day). If no end time is designated, then the system shall default to 24:00 (end-of-day). Holidays shall require the use of 24-hour time format, e.g. 17:00 is 5:00PM.
- J. Reports:
 - 1. The system shall be capable of producing a variety of predefined reports regarding software and security hardware configuration, event history, and the administration of people within the system.
 - 2. The system shall support a graphic interface for interactively building custom reports from either historical or personnel data. These reports shall be savable for later reuse. Parameters shall be inserted into reports to prompt for data input at report runtime. Report results shall be printed, output to a PDF file or put into a spreadsheet.

3. The system shall be capable of sorting users by various criteria, including email address, and allow for email groups to be selected for auto-distribution.
4. Report generation shall not affect the real-time operation of the system.
5. The specific reports provided shall include the following:
 - a. Configuration Reports
 - b. Access History - Displays access history based on an entered query. The system user can specify the query using either the keyboard or point-and-click selection.
 - c. Custom Report - This provides the capability to create custom reports of historical data.
 - d. General Event History - Displays time, type of activity, and activity details for a variety of event types. The system user can select the specific event types for the report.
 - e. Audit Trail: Displays an audit trail of system changes and the name of the system user that made the changes. It shall be possible to specify the dates and times covered in the report.
 - f. People Reports
 - g. Access Levels - Displays all access levels entered into the system including time specification, reader/reader group, and floor group.
 - h. Credential Audit - Lists existing credentials by their current status settings (such as Active, Damaged, Lost, or Not Used). Before running the report, users can filter the data to see only credentials with a particular status setting, or only credentials that were not used with a specific number of days from the date they were issued.
 - i. Current Users - Displays a list of all security system users currently logged in to the security system website.
 - j. Custom Report - This provides the capability to create custom reports of personnel data. A graphic interface provides the user with the ability to interactively create and save reports for later use. Parameters can be inserted into reports to prompt for data input at report runtime. Custom report configuration shall include page size, orientation, column width and shall automatically notify the user if the selected configuration exceeds the selected page size.
- K. Administration - The system shall provide for the performance of system administration tasks from any network-connected computer with a browser. These administrative tasks shall include but not be limited to:
 1. Generating reports:
 - a. The system shall be capable of producing a variety of predefined reports regarding software and security hardware configuration, event history, and the administration of people within the system.
 - b. Alternatively, the system shall support a graphic interface for interactively building custom reports from either historical or personnel data. These reports shall be savable for later reuse. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a PDF file or put into a spreadsheet.
 - c. A system user holding "Administrator" permissions shall be able to view and create reports.
 2. Database backups:
 - a. It shall also be possible for the system users to create such database backups at any time. Any database backups onboard the MonitorCast v4 Server may also be downloaded to IP Door Controller storage by the system user at any time.
 3. System restore:
 - a. The system shall be able to restore its database, or the full system data, from a backup. Restoration of the system shall only be possible from a backup copy onboard the MonitorCast v8 Server. It shall, therefore, be possible to upload a copy of a database backup from any network attached storage.
 4. Software updates:
 - a. Software updates, upgrades and patches shall be provided from time to time. The system shall be able to update its software from these files. Update of the application software shall only be possible from an update file onboard the Server. It shall, therefore, be possible to upload a copy of the software update from any network attached storage or from any PC drive or desktop.

- b. Software updates may involve the Server only or may include updates for the IP Door Controller also. The monitoring of the security system may be unavailable for several minutes during this process.
- 5. Enrolling new people - All person data entered into the system shall be held in the system database and shall be available only to system users holding at least the Administer user role. Person data can be added, deleted, and edited by such system users.
- 6. Configuring network resources:
 - a. DNS - The system shall support setting IP addresses for up to two domain name MonitorCast v8 Servers.
 - b. Email settings - The system shall support the use of email notifications of alarm events. The system user must setup the email MonitorCast v8 Server IP address or DNS name and the email address of the Network Controller. A network administrator must setup the network mail MonitorCast v8 Server to relay email for the IP address of the Network Controller.
 - c. Time MonitorCast v8 Servers - The system shall support the use of network time MonitorCast v8 Servers. Up to three MonitorCast v8 Servers can be designated. Use of a network time MonitorCast v8 Server ensures that the Network Controller and its nodes will be regularly synchronized with the exact time used by all other network resources.
 - d. A system user holding "Setup" permissions shall be able to configure network resources.
- 7. LDAP - It shall be possible to configure an Active Directory MonitorCast v8 Server with the system.
 - a. This shall provide single user-login capability.
 - b. Password rules and authentication shall be governed by the LDAP MonitorCast v8 Server.

2.06 CERTIFICATIONS

- A. UL 294 listed.
- B. ISO 9000 listed.
- C. CE Compliant.
- D. RoHS.

PART 3 – EXECUTION

3.01 GENERAL

- A. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's instructions. All wiring shall be of the type and quantity recommended by the controls manufacturer, and hardware manufacturer, and approved by the local authority having jurisdiction.

3.02 MANUFACTURER'S INSTRUCTIONS

- A. Install all equipment in accordance with the manufacturer's recommendations and accepted shop drawings.
- B. Install all equipment in compliance with NEC requirements, NECA's "Standard of Installation" and recognized industry practices.

3.03 WIRING

- A. All wiring shall be installed in dedicated conduit throughout. Conductors routed to the individual device shall be continuous from the head end cabinet to the device.
- B. All wiring shall be clearly identified and labeled according to the device it controls. Where possible, use architectural door numbers or room numbers to identify conductors.
- C. Where conduit is routed below grade, provide cabling rated for wet locations.
- D. All equipment wiring shall be laced and fastened in place using tie wraps or equal. Cabled runs shall be straight and either parallel or perpendicular to cabinet walls.
- E. Provide adequate length of conductors. Bundle, lace and route the conductors to terminal points in a uniform fashion without excess.
- F. All signal wiring shall be shielded. Line level circuits and loudspeaker circuits shall be adequately spaced from each other and from other power circuits.
- G. Maintain separation between signal level circuits and power circuits per NEC.

3.04 EQUIPMENT ENCLOSURES

- A. Maintain 3-foot working clearances on each side of equipment or equipment racks where access is required to inspect service or adjust.
- B. All equipment cabinets, boxes, enclosures or racks shall be clearly labeled and identified. Use identifiers and abbreviations defined in the Drawings wherever possible. Use plain designation for labeling, unless indicated otherwise.
- C. Provide weatherproof enclosures for items mounted outdoors or exposed to harsh environmental conditions.
- D. Check equipment against available mounting space indicated on the drawings. Coordinate location of equipment with other devices to minimize interference. Any conflicts or clearance problems shall be brought to the attention of the Engineer.

3.05 EXAMINATION

- A. Verify that related conditions, including equipment that has been previously installed under other related sections are acceptable for product installation in accordance with manufacturer's instructions.

3.06 TESTING

- A. The system shall be installed and fully tested under the supervision of a technician, trained for the said system.
- B. Adjust audio levels for optimal audio quality and intelligibility.
- C. Set audio threshold on all cell ceiling / light fixture mounted speakers for optimal settings to prevent false activation.
- D. The system shall be demonstrated to perform all of the functions shown on the plans and as specified herein.
- E. Document all test procedures and protocols and provide a copy of test results for each system to the Engineer prior to substantial completion.

3.07 PROTECTION AND CLEANING

- A. Stored Materials and equipment excepting wire shall be stored in a controlled environment and must be protected from harmful conditions such as extreme temperature, moisture, humidity, and dirt.
- B. Repair or replace any damaged equipment or components prior to substantial completion.
- C. Remove temporary tags coverings and construction debris from interior and exterior surfaces of equipment.
- D. Clean internal air filters, grills, and fans before substantial completion.

3.08 WARRANTY

- A. See section 28 23 00 for warranty requirements.

3.09 SPARE PARTS

- A. Provide to the owner at project closeout the following spare parts:
 - 1. Provide one (1) spare access control board of each type used.
 - 2. Provide two (2) spare access control readers of each type used.

3.10 TRAINING

- A. See section 28 23 00 for training requirements.

END OF SECTION

SECTION 282380
EQUIPMENT RACKS AND UPS SYSTEMS**PART 1 – GENERAL****1.01 DESCRIPTION OF WORK**

- A. Provide all material and labor for all cabinets and enclosures required by the Electronic Security system for this project.
- B. Provide all connection accessories to make this a full working system. All fittings, extenders, and supplementary items shall be provided for a complete and security installation.

1.02 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this section.
- B. Division 28 work related to this section:
 - 1. 28 23 00 Security Electronics General
 - 2. 28 23 20 Touch Screen Control system
 - 3. 28 23 30 Intercommunication System
 - 4. 28 23 40 CCTV System
 - 5. 28 23 80 Equipment Racks and UPS Systems

1.03 SUMMARY

- A. Provide cabinets and enclosures for the protection and security of the equipment contained within the cabinet or enclosure.
- B. All cabinets and enclosures shall be rated for the space within which they are installed unless noted otherwise.
 - 1. Type 1: Indoor use - protect against contact with equipment located inside and protect against dirt and dust.
 - 2. Type 3: Outdoor use – protect against windblown dust and rain, and protect against formation of ice on the enclosure
 - 3. Type 3R: Outdoor use - protect against windblown dust and rain, and protect against formation of ice on the enclosure
 - 4. Type 4: Indoor or Outdoor use – protect against falling rain, splashing water and protect against the formation of ice on the enclosure.
 - 5. Type 4X: Indoor or Outdoor use - protect against falling rain, splashing water and protect against the formation of ice on the enclosure; resists corrosion
 - 6. Type 12: Indoor use: provide protection against dust, dirt, fiber, dripping water, and condensation of non-corrosive liquids.
- C. Refer to other Division 28 sections for cabling, installation, identification and termination requirements.

PART 2 - PRODUCTS**2.01 GENERAL**

- A. Cabinet & Enclosures for Security Equipment
 - 1. Acceptable Manufacturers
 - a. Atlas Soundolier
 - b. Eldon
 - c. Austin Company
 - d. Hoffman
 - e. Middle Atlantic Products, Inc.
 - f. Lowell
 - g. Winsted
- B. Cabinet & Enclosures for Server Equipment
 - 1. Acceptable Manufacturers
 - a. HP
 - b. APC

- c. Belkin
- d. Dell
- e. Chatsworth
- f. Lowell
- g. Middle Atlantic Products, Inc.

2.02 MATERIALS

A. Cabinets

- 1. Cold Rolled steel units, 12 Ga angles, 14 Ga posts, 16 Ga molding and braces.
- 2. 16 Ga flush mount doors; flush or louvered with flush pulls
- 3. 16 Ga flush mount; flush or louvered, easy removal.
- 4. Floor Mounted Units
 - a. Door Control & Video Equipment Cabinets: Nominal 30" deep x 30" wide; 72-90" high; 24" EIA rack mounting frames.
 - b. Intercom & Paging Equipment Cabinets: Nominal 30" deep x 24" wide' 72-90" high; 19" EIA rack mounting frames.
 - c. Provide doors with key locks on all cabinets.
 - d. Provide louvers as required for cooling equipment.
 - e. Provide ventilation fans to maintain manufacturer recommended temperatures for equipment.
 - f. Provide electrical outlet and power strip for power supplies. Install wire ties around plugs to prevent the plug from being removed accidentally.

B. Enclosures

- 1. Provide wall mounted equipment as needed in Electronic Security system rooms.
- 2. Provide hinged door with keyed lock.
- 3. Provide ventilation fans to maintain manufacturer recommended temperatures for equipment.

2.03 RACK FABRICATION

- A. Install enclosures to easily accommodate interconnecting cables from above or below through the use of cable trays or conduits.
- B. Combine wires/cables by types and boards. Provide installation meeting National Electrical Code clearances, cabling installation and circuit separation requirements.
- C. Organize all wiring and cable routing by device types. Provide cabling support and tie up throughout the cabinet to provide a clean installation.
- D. No splices permitted from field device to head end connection.
- E. Provide grounding of all equipment as required by NEC.
- F. Provide protection from contact of terminals and exposed conductors.
- G. Provide din rail and mounting equipment for all applications. All equipment shall be accessible from each side of the cabinet as needed. Do not block access to required equipment to be maintained.

2.04 UNINTERRUPTIBLE POWER SUPPLY SYSTEM

- A. Acceptable Manufacturers - Except as otherwise specified, herein, or in the General Conditions, the equipment and materials of this Section shall be products of the following manufacturers, subject to compliance with specification requirements and provided each manufacturer meets all requirements of the Quality Assurance Section of this specification.
 - 1. Powerware/Eaton
 - 2. APC
 - 3. Cyber Power
 - 4. Tripplite
- B. Provide for each electronic equipment room as shown on the plans an Uninterruptible Power Supply system to supply 120-volt AC power for all PLC, intercom masters/amps, and switching, CCTV cameras, video recording, network equipment and door control equipment.
- C. All Electrically powered equipment provided under division 28 shall be connected through UPS system power.

- D. Each UPS system shall independently receive its power supply directly from the main/emergency power supply of the facility. The UPS system shall have the capacity to furnish the required total power for not less than twenty (20) minutes in the event of failure of the normal and emergency power source. The UPS system shall have visual and audible trouble indicators and annunciator as scheduled.
- E. The UPS system shall include the electrical operation of the door control system, intercom and CCTV system, simultaneously in the event of power outage.
- F. Construction: The Uninterruptible power supply shall have an output voltage of 120 volts and a full load current capable of supplying all systems indicated herein. The unit shall operate with an input voltage of 120 volts, single phase, 60 cycles. The output frequency stability when operating without an input shall be $\pm 0.25\%$. Static voltage regulation shall not exceed $\pm 2\%$ with a dynamic regulation of $\pm 10\%$ for any load change not exceeding 20% of full load rating. The security contractor is responsible for sizing all UPS systems to meet the twenty (20) minute requirements.
 - 1. The unit shall operate normally with a ± 10 volts input voltage with a .85 power factor, from 0 degrees to 40 degrees in a humidity of 0% to 95% and shall deliver 150% of rated power for 10 seconds and 125% for 10 minutes.
 - 2. In the event of an inverter malfunction, the system shall switch to the incoming AC line through a solid state static transfer switch in less than 50 milliseconds. The inverter shall shut down and give an alarm when the input voltage drops below 95 volts DC.
 - 3. Batteries: The batteries shall be sealed, heavy duty and radial grids for mechanical strength with low grid corrosion rate PVC plastic separators for low internal resistance. Furnish the required number of batteries to supply 120 volts to the load for a period of twenty (20) minutes. The complete system (batteries and UPS system) shall be furnished and guaranteed by the same manufacturer.
 - 4. The unit shall have a DC voltmeter, AC voltmeter, DC ammeter, AC ammeter, frequency meter and the following status indicators:
 - a. AC Input Line Present
 - b. Rectifier Output Normal
 - c. Battery Charger Normal
 - d. Inverter Normal
 - e. Critical Load Source Normal
 - f. Critical Load On Bypass Line
 - g. Over Temperature
 - h. Bypass Line Fuse Open
 - i. Battery Breaker Open
 - j. Rectifier Inoperative
 - k. Inverter Source Normal
 - l. Operating From Battery
 - m. Battery Charger Inoperative
 - n. Battery Low
 - o. Inverter Overload
 - p. Inverter Inoperative
 - q. Critical Load Power Normal
 - 5. Provide power load calculations for each UPS in the Security System Submittals

2.05 UPS UNITS

- A. Security Electronics Head End equipment – Provide UPS system backup of not less than 20 minutes for all head end equipment.
- B. Provide load calculations in submittals.
- C. Provide one 1500VA uninterruptible power supply for each PC that is supplied with the Security Electronics System. Each unit will contain non-spillable sealed lead acid type batteries that can deliver power at full load for approximately 20 minutes.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Check location, “roughing in”, and field dimensions prior to beginning work.

- B. Do not begin installation until all unsatisfactory conditions have been corrected.
- C. Verify field measurements are as shown on Drawings and as instructed by manufacturer.
- D. Verify that required utilities are available, in proper location, and ready for use.

3.02 INSTALLATION/APPLICATION

- A. Provide wire management throughout cabinets and enclosures.
- B. Replace equipment, components, & wiring as required to achieve a fully functional system.

END OF SECTION

SECTION 284600
FIRE DETECTION AND ALARM**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fire alarm/Voice Evacuation/Mass Notification system design and installation, including all components, wiring, and conduit.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping: Materials and methods for work to be performed by this installer.
- B. Section 087100 - Door Hardware: Electrically operated locks and door holder devices to be monitored and released by fire alarm system. Specifically the overhead coiling doors in the corridor.
- C. Section 211300 - Fire Suppression Sprinklers: Supervisory, alarm, and actuating devices installed in sprinkler system.
- D. Section 233300 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

1.03 REFERENCE STANDARDS

- A. UL 864 - Standard for Control Units and Accessories for Fire Alarm Systems
- B. UL 2572 - Standard for Mass Notification Systems
- C. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- D. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- E. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Proposal Documents: Submit the following with cost/time proposal:
 - 1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
 - 3. Certification by Contractor that the system design will comply with Contract Documents.
- C. Evidence of designer qualifications.
- D. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
 - 1. Copy (if any) of list of data required by authority having jurisdiction.
 - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
 - 4. System zone boundaries and interfaces to fire safety systems.
 - 5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
 - 6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
 - 7. List of all devices on each signaling line circuit, with spare capacity indicated.
 - 8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
 - 9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.

10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
 11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
 12. Certification by Contractor that the system design complies with Contract Documents.
- E. Evidence of installer qualifications.
- F. Evidence of instructor qualifications; training lesson plan outline.
- G. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
 2. Submit documentation of satisfactory inspections and tests.
 3. Submit NFPA 72 "Inspection and Test Form," filled out.
- H. Operating and Maintenance Data: See Section 017800 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
 2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
 3. List of recommended spare parts, tools, and instruments for testing.
 4. Replacement parts list with current prices, and source of supply.
 5. Detailed troubleshooting guide and large scale input/output matrix.
 6. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
 7. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- I. Project Record Documents: See Section 017800 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- J. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
 2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.
- B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
 2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
 3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
- C. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

1.06 SYSTEM INTEGRATION AND COORDINATION

- A. The Emergency Voice/Alarm Communication System (EVACS/MNS) shall be the primary system of record for Fire Alarm, Severe Weather and Security/Lockdown emergency messaging, in accordance with NFPA 72 Chapter 24.

- B. The system shall be capable of prioritizing emergency messaging (Fire highest priority, followed by Security/Lockdown, then Severe Weather).
- C. Coordinate with Division 27 specifications (Intercom/Paging) to ensure:
 - 1. Intercom paging is muted/silenced during emergency voice messages.
 - 2. Lockdown and weather alerts initiated from the intercom console are relayed through the MNS with proper priority.
- D. Separate Speakers
 - 1. Fire Alarm/EVACS/MNS speakers and Intercom/Paging Speakers shall be installed separately.
 - 2. Fire/MNS speakers shall be located per NFPA 72 Chapter 18 and Chapter 24 to ensure audibility and intelligibility.
 - 3. Intercom speakers may be located adjacent for daily paging.
 - 4. Both systems shall be coordinated so Fire/MNS messages mute intercom audio automatically.

1.07 WARRANTY

- A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.
- B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Alarm Control Units and Accessories - Basis of Design: Siemens Building Technologies, Inc.
- B. Substitutions: See Section 016000 - Product Requirements.
 - 1. For other acceptable manufacturers of control units specified, submit product data showing equivalent features and compliance with Contract Documents.
 - 2. For substitution of products by manufacturers not listed, submit product data showing features and certification by Contractor that the design will comply with Contract Documents. 10 day prior to bid approval required.

2.02 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide a new automatic fire detection and alarm/voice evac. system:
 - 1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
 - 2. Protected Premises: Entire building shown on drawings.
 - 3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
 - a. ADA Standards.
 - b. The requirements of the local authority having jurisdiction.
 - c. Applicable local codes.
 - d. Contract Documents (drawings and specifications).
 - e. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
 - 4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
 - 5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
 - 6. Program notification zones and voice messages as directed by Owner.
- B. Supervising Stations and Fire Department Connections:
 - 1. Fire Alarm signals shall be transmitted to a UL-Listed Remote or Central Supervising Station in accordance with NFPA 72 Chapter 26.
 - 2. Transmission shall use a dual-path communicator (primary IP over Ethernet, secondary LTE/Cellular) listed for fire alarm service (UL 864/UL 1610/UL 1635 as applicable)

3. Both paths shall be supervised, with active polling intervals and restoral times programmed in accordance with NFPA 72 (active IP path supervision less than or equal to 5 minutes, cellular less than or equal to 60 minutes)
 4. Provide physically diverse routing of primary and backup paths where practicable.
 5. On-premise supervising station and dedicated Cat 6 cable methods shall not be used unless explicitly approved by the AHJ.
- C. Intelligibility Requirements:
1. The Emergency Voice/Alarm Communications Systems shall be designed to achieve intelligible voice reproduction in accordance with NFPA 72 Chapter 24.
 2. Intelligibility shall be measured using Speech Transmission Index (STI or STIPA) or equivalent approved method.
 3. Minimum performance targets:
 - a. STI greater than or equal to 0.50 in classrooms, offices, and occupied rooms.
 - b. STI greater than or equal to 0.45 in corridors, assembly areas, and large-volume spaces.
 4. Audibility alone shall not be accepted as evidence of compliance.
 5. The Contractor shall provide both:
 - a. Pre-Install design analysis (modeling speaker placement and acoustic coverage).
 - b. Post-Install verification testing in representative sample areas, witnessed by the Engineer.
 6. Intelligibility results, test locations, and methods shall be documented in the Record of Completion.
- D. Pathway Survivability and Classification
1. General Requirements
 - a. Fire Alarm, emergency voice/alarm communication (EVAC), and mass notification system (MNS) circuits shall be installed in accordance with NFPA 72 (Latest Edition), NFPA 70 (NEC), and the IBC/IFC as adopted by the Authority Having Jurisdiction (AHJ). Pathways shall be designed and installed to ensure survivability of critical notification circuits during fire conditions.
 - b. Pathway Classifications
 - 1) Initiating Device Circuits (IDC): Minimum Class B. Class A shall be provided where required by NFPA 72 or the AHJ.
 - 2) Signaling Line Circuits (SLC): Class A, Style 6 or 7.
 - 3) Notification Appliance Circuits (NAC): Class A for all life safety circuits associated with evacuation and mass notification.
 - 4) Data/Control Circuits for EVAC/MNS: Class X (preferred) or Class A to maintain operation under single open, ground fault, or short-circuit conditions.
 - c. Pathway Survivability Levels (Per NFPA 72, Section 12.4)
 - 1) Level 0: No survivability. Not acceptable for EVAC/MNS circuits.
 - 2) Level 1: Pathways in metal raceway or cable with 2-hour fire rating. Permitted for limited use where approved.
 - 3) Level 2: Pathways in 2-hour fire-rated cable (CI Cable), or in 2-hour fire-rated construction, or installed in a listed 2-hour circuit integrity system. Required for all fire command center to notification zone circuits.
 - 4) Level 3: Pathways in 2-hour fire-rated cable/circuit integrity system routed outside of the evacuation zone being served. Required for critical mass notification and in-building fire command-to-remote location connections.
 - d. Application by System Function
 - 1) Fire Alarm Notification Appliance Circuits: Minimum Pathway Survivability Level 2.
 - 2) Voice Evacuation Speaker/Control Circuits: Minimum Pathway Survivability Level 2.
 - 3) Mass Notification Backbone Circuits: Minimum Pathway Survivability Level 3.
 - 4) Control Circuits Serving Multiple Fire/Safety Functions: Survivability Level per most stringent function served.
 - 5) Interfacing with Emergency Communication Systems (ECS): Must be Level 2 or 3 depending on AHJ Requirements and building risk category.
 - e. Additional Provisions

- 1) All riser and backbone circuits shall be installed in a 2-hour fire rated shaft, conduit, or CI Cable.
 - 2) Where pathways cross fire/smoke barriers, penetrations shall be protected with UL-Listed firestop systems.
 - 3) Redundant routing shall be provided where required to achieve pathway survivability.
 - 4) Contractor shall provide manufacturer's listing documentation and cable cut sheets verifying compliance with survivability level requirements.
- E. Spare Capacity:
1. Initiating Device Circuits: Minimum 25 percent spare capacity.
 2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
 3. Speaker Amplifiers: Minimum 25 percent spare capacity.
 4. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than pull-in control modules.
- F. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
 2. Secondary: Storage batteries.
 - a. Provide integral sealed lead-acid batteries sized for not less than 24 hours of standby operation followed by 15 minutes of alarm operation at full rated amplifier load, in accordance with NFPA 72 Chapter 10 and Chapter 24
 - b. Battery calculations shall be based on worst-case connected load, including all amplifiers at 100% of rated output.
 - c. Provide separate battery sets for each fire alarm control panel, voice evacuation panel, distributed audio panel, and amplifier cabinet.
 - d. Uninterruptible Power Supply (UPS) equipment shall not substitute for required secondary power capacity. UPS devices may be provided only for operator work stations, network servers, and graphics computers to maintain operator visibility, and shall be independent of NFPA 72 required standby power.

2.03 FIRE SAFETY SYSTEMS INTERFACES

- A. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Sprinkler water flow.
 2. Duct smoke detectors.
- B. HVAC:
1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.
- C. Doors:
1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor. Refer to Section 087100.
 2. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from. Refer to Section 087100.
 3. Detention Space Doors shall not be unlocked upon activation of fire alarm system. Doors shall remain locked.

2.04 COMPONENTS

- A. General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Fire Alarm/Voice Evac Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.
- C. Master Control Unit: As specified for Basis of Design above, or equivalent.
- D. Initiating Devices:

1. Addressable Systems:
 - a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
 - b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
- E. Notification Appliances - Performance Requirements:
 1. Manual Pull Stations: Double-action type, ADA-compliant, listed for fire alarm service, mounted 42 inches above finished floor to center of device. Resettable by key common to the system.
 2. Speakers
 - a. Operate on a 70-volt distributed audio system with integral taps for 1/4, 1/2, 1, 2, and 4 watt settings.
 - b. UL 1480 listed for fire alarm service.
 - c. Provide end-of-line supervision at the end of each circuit.
 - d. Coverage and placement shall achieve intelligibility as specified in Section 2.02.C
 3. Strobes
 - a. UL 1971 (public mode) listed.
 - b. Multi-candela type, field-selectable at 15, 30, 75, and 110 cd (minimum).
 - c. Strobes shall be synchronized within each notification zone per NFPA 72 Chapter 18
 - d. Mounting heights and coverage shall comply with ADA and NFPA 72 requirements.
 4. Combination Speakers/Strobes: Shall meet both speaker and strobe criteria above.
 5. Appliance Synchronization: All visible appliances within a notification zone shall flash in synchrony; all audible appliances shall produce Temporal-3 for fire alarm events and distinctive tones for mass notification events.
 6. Appliance Supervision: Provide end-of-line supervision modules for each notification circuit, located at the last device.
- F. Amplifier Redundancy and Speaker Circuiting:
 1. Provide the voice/evacuation/mass notification system with N+1 amplifier redundancy (or an approved automatic backup channel) so that failure of a single amplifier does not disable required audio notification in any evacuation zone.
 2. Distribute speaker loads and circuits such that the loss of any one speaker circuit, amplifier, or control channel will not silence an entire floor, wing, or smoke compartment.
 3. Provide automatic transfer of speaker circuits to standby amplifier upon detection of an amplifier fault.
 4. Document amplifier capacity, redundancy scheme, and circuit zoning in the shop drawings and I/O matrix, and verify during acceptance testing.
- G. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
- H. Locks and Keys: Deliver keys to Owner.
- I. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
 1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
 2. Provide one for each control unit where operations are to be performed.
 3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
 4. Provide extra copy with operation and maintenance data submittal.
- J. Storage Cabinet for Spare Parts and Tools: Steel with baked enamel finish, size appropriate to quantity of parts and tools.
 1. Padlock eye and hasp for lock furnished by Owner.
 2. Locate as directed by Owner.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain Owner's approval of locations of devices, before installation.
- D. Install instruction cards and labels.
- E. Grounding and Bonding: Bond all system cabinets, racks, controllers, power supplies, and cable shields to the telecommunication grounding busbar (TGB/TMGB) in accordance with Section 260526 - Grounding and Bonding. Coordinate with Division 26 Electrical contractor for proper conductor sizing, routing, and terminations.

3.02 INSPECTION AND TESTING FOR COMPLETION

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
- H. Verify that dual-path transmission, polling interval compliance, and signal receipt at the supervising station.
- I. Provide battery load testing under full amplifier load.
- J. Demonstrate automatic amplifier backup operation and zone isolation testing.
- K. Verify synchronization of strobes and audibility/intelligibility of speakers in accordance with NFPA 72 Ch. 14.
- L. Testing of intercom override and priority operation.
- M. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
 - 1. Record all system operations and malfunctions.
 - 2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
 - 3. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.03 OWNER TRAINING

- A. Provide training sessions tailored to different user groups.
 - 1. Facilities/Maintenance Staff: Minimum 4 hours of hands-on training covering alarm/trouble conditions, device disable/enable, voice paging, amplifier/speaker troubleshooting, battery replacement, and software management.
 - 2. Administrative/Security/SRO Staff: Minimum 2 hours of training on initiating and managing mass notification events (Fire, Lockdown, Severe Weather), using live paging, and understanding message priority.
- B. Training shall be conducted by manufacturer-certified factory instructor, with sessions recorded in digital format (video file or online link) and delivered to the Owner for future reference.
- C. Provide a written quick-reference guide (laminated cards or wall chart) for common operator functions at the main control panel and remote operator consoles.
- D. Provide full as-programmed configuration files, software licenses, access credentials, and passwords to the owner at turnover. System shall not include "locked" or proprietary programming blocks that prevent the Owner from service/expansion.
- E. Provide complete O&M manuals including:

1. Final as-built drawings and I/O matrix.
2. Manufacturer data sheets for all devices.
3. NFPA 72-compliant Record of Completion and test/inspection forms.
4. Battery and amplifier load calculations.
5. Service/maintenance schedules and recommended spare parts list.

3.04 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
 1. Be prepared to conduct any of the required tests.
 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
 3. Have authorized technical representative of control unit manufacturer present during demonstration.
 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
 5. Repeat demonstration until successful.

END OF SECTION

SECTION 312200
GRADING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Removal of topsoil.
- B. Rough grading the site for site structures, building pads, and sidewalks.
- C. Finish grading.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Topsoil: Topsoil shall consist of natural friable soil that is representative of soils in the vicinity which produce heavy growths of crops, grass, or other vegetation and is reasonably free from underlying subsoil, clay lumps, objectionable weeds, litter, brush, matted roots, toxic substances, or any material that might be harmful to plan growth or be hindrance to grading, planting, or maintenance operations.
- B. Obtain approved topsoil material off-site when satisfactory topsoil materials are not available on-site.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Verify the absence of standing or ponding water.
- C. Poor soils conditions and groundwater may be encountered and should be expected on the site.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
- D. Notify utility company to remove and relocate utilities.
- E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.
- F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
- G. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.
- H. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

3.03 TOPSOIL STRIPPING

- A. Once all demolition and clearing operations have been completed, topsoil stripping excavations shall be continued to the limits and depths indicated indicated on the drawings.

3.04 SOIL STOCKPILING

- A. Stockpile topsoil to be re-used on site; remove remainder from site.
- B. Locate stockpiles where they will not interfere with the construction phases and at least 15 feet away from areas of concentrated flows or pavements.
- C. Protect stockpiles from erosion.

3.05 FINISH GRADING

- A. Before Finish Grading:
 - 1. Verify building and trench backfilling have been inspected.
 - 2. Verify subgrade has been contoured and compacted.

- B. Remove debris, roots, branches, stones, in excess of 1/2 inch (13 mm) in size. Remove soil contaminated with petroleum products.
- C. Where topsoil is to be placed, scarify surface to depth of 2 inches (____ mm).
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 2 inches (____ mm).
- E. Place topsoil in areas where sodding are indicated.
- F. Place topsoil where required to level finish grade.
- G. Place topsoil to nominal depth of 2 inches (____ mm).
- H. Place topsoil during dry weather.
- I. Remove roots, weeds, rocks, and foreign material while spreading.
- J. Near plants spread topsoil manually to prevent damage.
- K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- L. Lightly compact placed topsoil.
- M. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.06 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) (30 mm) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch) (13 mm).

3.07 REPAIR AND RESTORATION

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Engineer/Architect as to remedy.
- C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.
- D. Protecting Graded Areas: Protect newly graded areas from traffic and erosion.
- E. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

3.08 FIELD QUALITY CONTROL

- A. See Section 312323 for compaction density testing.

3.09 CLEANING

- A. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 312316.13
TRENCHING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Backfilling and compacting for utilities to utility main connections.

1.02 REFERENCE STANDARDS

- A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2025.
- B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.
- C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012 (Reapproved 2021).
- D. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.
- E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)); 2012 (Reapproved 2021).
- F. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.
- G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017 (Reapproved 2025).
- H. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).
- I. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.
- J. Mississippi Standard Specifications for Road and Bridge Construction, 2004.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where they will not interfere with the construction phases and at least 15 feet away from areas of concentrated flows or pavemtns.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS**2.01 BEDDING AND FILL MATERIALS**

- A. Select Foundation Material: Select Foundation Material shall meet the requirements of MDOT Size II Course Stabilizer Aggregate.
- B. Select Bedding Material: Select Bedding material shall consist of clean sand with less than 10 percent passing the No. 200 sieve.
- C. Select Backfill Material: Select Backfill material shall meet the requirements of Structural Fill per Section 312323.
- D. See Section 312323 for additional fill material requirements.

2.02 ACCESSORIES

- A. Warning Tape: Warning tape shall be metallic or polyethylene film warning tape manufactured for making and identifying underground utilities, 3 inches wide and 4 mils thick, continuously inscribed with a description of the utility.
- B. Locator Wire: Locator wire shall be fourteen (14) gauge solid copper insulated wire.

2.03 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Engineer/Architect.

3.03 TRENCHING

- A. Excavate trenches to indicated widths, gradients, lines, depths, and elevations as indicated on the drawings.
- B. All pipe and associated fittings/structures will be installed in accordance with manufacturer's recommendations unless more stringent requirements are imposed by the drawings and these specifications.
- C. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape sub-grade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- D. Remove projecting stones and sharp objects along trench sub-grade.
- E. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Engineer/Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- F. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot (305 mm) into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Engineer/Architect.

3.04 FOUNDATION FOR UTILITY PLACEMENT

- A. When native material at the bottom of the trench is not a suitable foundation for the pipe or conduit, excavate trench an additional 6 inches and replace with approved Foundation Material.

3.05 BEDDING FOR UTILITY PLACEMENT

- A. Place and compact bedding material on trench bottoms as indicated on the drawings. Shape bedding material to provide continuous support of bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. The bedding material shall be Suitable Soil secured from the trench excavation and shall be thoroughly compacted to a minimum 95 percent of Standard Proctor Density (ASTM D 698).
- C. When the native soil is not suitable for bedding material then a minimum of 4 inches of Select Bedding Material shall be compacted to a minimum of 95 percent of the Standard Proctor Density (ASTM D 698).

3.06 INITIAL BACKFILLING

- A. Coordinate backfilling with utility testing.
- B. Place and compact initial backfill to a height of 12 inches over the utility pipe or conduit. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit.
- C. The backfill material shall be Suitable Soil secured from the trench excavation and shall be thoroughly compacted to a minimum 95 percent of Standard Proctor Density (ASTM D 698).
- D. When the native soil is not suitable for backfill material then backfill with Select Backfill Material compacted to a minimum of 95 percent of the Standard Proctor Density (ASTM D 698).
- E. See Section 312323 for further backfill requirements.
- F. Correct areas that are over-excavated.
- G. Reshape and re-compact fills subjected to vehicular traffic.

3.07 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 1 inch (25 mm) from required elevations.
- B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch (25 mm) from required elevations.

3.08 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

3.09 CLEANING

- A. Leave unused materials in a neat, compact stockpile.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

**SECTION 312316
EXCAVATION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Excavating for building volume below grade, footings, and site structures.
- B. Trenching for utilities to utility main connections.
- C. Section 015713 - Temporary Erosion and Sediment Control: Slope protection and erosion control.
- D. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring. General requirements for dewatering of excavations and water control.
- E. Section 024100 - Demolition: Shoring and underpinning existing structures.
- F. Section 312316.13 - Trenching: Excavating for utility trenches as shown on the plans.
- G. Section 312316.26 - Rock Removal: Removal of rock during excavating.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.

1.03 DEFINITIONS

- A. Unclassified Excavation: Unclassified Excavations will consist of all excavation materials of whatever character encountered in the work except for those classes of excavation for which separate pay items are provided.
- B. Muck Excavation: Muck Excavation will consist of the excavation removal, hauling, and disposal of all unsatisfactory and unsuitable material in accordance with the plans and specifications.
- C. Excess Excavation: Excess Excavation will consist of excavation which cannot be satisfactorily used or disposed of within the project limits. Excess Excavation may include any type, kind, or class of excavation determined by the Engineer that must be removed.

PART 2 PRODUCTS**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.02 EXCAVATING

- A. Excavate to accommodate construction operations.
- B. Notify Engineer/Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard (0.25 cu m) measured by volume. See Section 312316.26 for removal of larger material.
- E. Provide temporary means and methods, as required, to remove all water from excavations until directed by Engineer/Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Provide for visual inspection of load-bearing excavated surfaces by Engineer/Architect before placement of foundations.

3.04 PROTECTION

- A. Divert surface flow from rains or water discharges from the excavation.

- B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.
- D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 312323
FILL**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Filling and compacting for building volume below grade, slabs-on-grade, and site structures.
- B. Backfilling and compacting for utilities to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.
- D. Lightweight concrete fill.

1.02 REFERENCE STANDARDS

- A. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012 (Reapproved 2021).
- C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)); 2012 (Reapproved 2021).
- D. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017 (Reapproved 2025).
- E. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where they will not interfere with the construction phases and at least 15 feet away from areas of concentrated flows or pavements.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS**2.01 FILL MATERIALS**

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations free from debris, roots, wood, scrap materials, vegetable matter, refuse or frozen material. Obtain approved fill materials off-site when satisfactory soil materials are not available on site.
- B. Suitable Soils: Suitable Soils shall be ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Sand: USCS Classification SP, SP-SM clean sand with less than ten percent (10%) passing the No. 200 sieve.
- D. Engineered Fill:
 - 1. USCS Classification CL, SC with liquid limit less than 45 and plasticity index greater than 10 and less than 25.

2.02 ACCESSORIES

- A. Geotextile Fabric: non-woven, geotextile; N-Series manufactured by Mirafi or approved equal.
- B. Vapor Retarder: 10 mil (0.25 mm) thick, polyethylene.

2.03 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.
- C. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

- A. Scarify and proof roll subgrade surface to a depth of 6 inches (150 mm) to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 DRAINAGE

- A. Effective drainage, including ditching and/or positive grading, should be established during the initial stages of site development and modified as necessary during construction.
- B. Groundwater may be encountered and should be expected during excavation work. When required the Contractor shall provide a system for controlling groundwater below excavations.
- C. Surface water shall be prevented from flowing into excavations and from flooding the project site and surrounding areas by methods approved by the Engineer.
- D. Contractor shall not allow water to accumulate in excavations. Remove water to prevent softening of foundation soils, undercutting of footings, and soil changes detrimental to the stability of sub-grades and foundations. Contractor shall not use trench excavation as temporary drainage ditches.
- E. Maintain grades so that the surface is well drained. When required the Contractor shall provide dewatering system necessary to convey water away from excavations.

3.04 EXCAVATION

- A. After clearing, grubbing, and stripping excavation are completed, excavate existing soils to depths necessary to accommodate site structures and install the required pavement sections.
- B. Suitable excavation materials shall be used as general fill in areas outside building or pavement areas as approved by the Engineer. If the site conditions permit, additional suitable excavation material may be wasted on site as approved by the Engineer.

3.05 UNAUTHORIZED EXCAVATION

- A. The Contractor will not be compensated for excavation beyond the dimensions and elevations as shown on the plans or that has been directed and approved by the Engineer.
- B. Any unauthorized excavation that requires filling shall be corrected at the Contractor's expense.
- C. No payment will be made for the removal, disposal, or replacement of material determined to be loosened or undercut through carelessness or negligence on the part of the Contractor.

3.06 SUB-GRADE INSPECTION AND PREPARATION

- A. After clearing, grubbing, and stripping excavations are completed, proof-roll the entire site using a loaded dump truck, having an axle weight of at least 10 tons to aid in identifying any additional localized soft or unsuitable material that should be removed.

- B. The existing sub-grade soils shall be thoroughly compacted until the soils at a depth of 12 inches achieve at least 95 percent of maximum dry density according to Standard Proctor Density (ASTM D 698).
- C. If unsatisfactory sub-grades are encountered or if the required compaction of in place soils cannot be achieved, additional undercutting and placement of appropriate fill material will be required.

3.07 REMOVAL OF UNSUITABLE MATERIALS

- A. When excavations encounter unsuitable materials below the bottom of the stripping or excavation to the depths required to accommodate the grading plan and other improvements, the Contractor will be required to remove the materials and backfill with appropriate fill material as approved by the Engineer.
- B. The depth and width of unsuitable or muck excavation will be as directed or approved by the Engineer.
- C. All muck and fill formations below the bottom of the stripping or excavation to the depths required to accommodate the grading plan and other improvements shall be measured as unit price pay items in the Unsuitable Soils Allowance.

3.08 GENERAL FILL PLACEMENT AND COMPACTION

- A. Fill materials shall be placed on prepared and inspected sub-grade to contours and elevations indicated using appropriate materials.
- B. Employ a placement method that does not disturb or damage other work.
- C. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. In areas where groundwater or saturated soil conditions are encountered during the required fill excavations, the initial lift of fill material should consist of Clean Sand placed to at least 2 feet above the static water table or to a distance to adequately bridge over the saturated soils. during placement below the groundwater table, the Clean Sand may be thoroughly "tracked" with a bulldozer in lieu of measured compaction tests.
- F. Fill material meeting the requirements of Suitable Soils shall be placed to obtain final grade outside of building and pavement areas. This material should be compacted in 6 inch loose lifts to not less than 95 percent of the maximum dry unit weight according to ASTM D 698 (Standard Proctor).
- G. Correct areas that are over-excavated.
- H. Reshape and re-compact fills subjected to vehicular traffic.

3.09 ENGINEERED FILL - LIGHTWEIGHT CONCRETE

- A. Install lightweight concrete fill according to manufacturer's written instructions.
- B. Use batching, mixing, and placing equipment approved by the manufacturer.
- C. Prevent segregation of material.
- D. Tolerance: Finished surface within 2 inches (50 mm) of elevation indicated on drawings.

3.10 FILL PLACEMENT AND COMPACTION FOR SITE STRUCTURES AND PAVEMENTS

- A. Fill material meeting the requirements of Structural Fill shall be placed to the required grades, lines, cross sections, and thickness as shown on the plans. This material should be compacted in 6 inch loose lifts to not less than 95 percent of the maximum dry unit weight according to ASTM D 698 (Standard Proctor).

3.11 FILL AT SPECIFIC LOCATIONS

3.12 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch (25 mm) from required elevations.

3.13 CLEANING AND PROTECTION

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.
- C. Protect newly graded areas from traffic and erosion.

- D. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

END OF SECTION

SECTION 313116
TERMITE CONTROL**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Chemical soil treatment for termite control.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
- C. Test Reports: Indicate regulatory agency approval reports when required.
- D. Manufacturer's Application Instructions: Indicate caution requirements .
- E. Certificate of compliance that products used comply with the U.S. Environmental Protection Agency (EPA) regulations and authority having jurisdiction for termiticides and toxicants and requirements applicable at the location of the Project.
- F. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing this type of work and:
 - 1. Having minimum of three (3) years documented experience.
 - 2. Licensed in the State in which the Project is located.
- B. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for preparing substrate and application.
- C. Use only termiticides that bear a federal registration number of the EPA and are approved by local authorities having jurisdiction.

1.04 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year installer's warranty from date of Substantial Completion against damage to building caused by termites.
- C. Furnish written warranty, executed by Applicator and Contractor, certifying that applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity is discovered during warranty period, Contractor will re-treat soil and repair or replace damage caused by termite infestation.

PART 2 PRODUCTS**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Do no apply during inclement weather.
- C. Verify all excavating, filling, and final grading is complete, except otherwise is required in construction operations.

3.02 PREPARATION

- A. Remove foreign matter that could decrease treatment effectiveness on areas to be treated. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction wasite wood from soil within and around foundations.
- B. Loosen, rake and level soil to be treated, except previously compacted areas under slabs and foundation. If recommended by toxicant manufacturer, toxicants may be applied before placing compacted fill under slabs.

3.03 PROTECTION

- A. Do not permit soil grading over treated work.

END OF SECTION

SECTION 321123
AGGREGATE BASE COURSES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The furnishing of all labor, materials, and equipment required for preparation of grade for proposed construction activities depicted in the construction documents.

1.02 RELATED REQUIREMENTS

- A. Section 312200 - Grading: Preparation of site for base course.
- B. Section 312316.13 - Trenching: Compacted fill over utility trenches under base course.
- C. Section 312323 - Fill: Compacted fill under base course.
- D. Section 321216 - Asphalt Paving: Finish and binder asphalt courses.

1.03 REFERENCE STANDARDS

- A. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012 (Reapproved 2021).
- B. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.
- C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)); 2012 (Reapproved 2021).
- D. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.
- E. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017 (Reapproved 2025).
- F. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. Aggregate Storage, General:
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Crushed Aggregate Base Course: Crushed Aggregate Base Course: Crushed Aggregate Base Course material shall dense-graded plant mixed crushed limestone, conforming to State of Louisiana Highway Department requirements for 610 Limestone.

2.02 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.

- B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the work are as indicated.
- B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

- A. Spread Crushed Aggregate Base Course material over prepared substrate and compact at optimum moisture content to not less than the percentage of maximum dry unit weight as shown on the drawings.
- B. Under all paving:
 - 1. Compact to 95 percent of material's maximum dry density as determined by ASTM D698.
 - 2. Moisture content must be within +/- 2% of optimum moisture content. If test is not within moisture content passing requirements, scarify material, compact and retest per ASTM D6938 In Place Density and water Content Determination by Nuclear Gauge.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch (6.4 mm) measured with 10 foot (3 m) straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch (6.4 mm).
- C. Variation From Design Elevation: Within 1/2 inch (12.8 mm).

3.05 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017 as applicable.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- D. Frequency of Tests: Perform at least one test for every 2,000 square feet of paved area but in no case fewer than three test.
- E. Prior to construction of pavements, proof roll compacted aggregate at surfaces that will be under paving.

3.06 CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 321216
ASPHALT PAVING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Hot Mix Asphalt (HMA) Pavements

1.02 RELATED REQUIREMENTS

- A. Section 321123 - Aggregate Base Courses: Aggregate base course.

1.03 REFERENCE STANDARDS

- A. Mississippi Standard Specifications for Road and Bridge Construction, 2004.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Mississippi Highways standard.
- B. Mixing Plant: Complying with State of Mississippi Highways standard.
- C. Obtain materials from same source throughout.

1.05 FIELD CONDITIONS

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Hot Mix Asphalt (HMA): In accordance with State of Mississippi Highways standards.
- B. Primer: In accordance with State of Louisiana Highways standards.
- C. Tack Coat: In accordance with State of Louisiana Highways standards.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

- A. Binder Course: Hot Mix Asphalt (HMA), ST, 19 mm in accordance with State of Louisiana Highways standards.
- B. Surface Course: Hot Mix Asphalt (HMA), ST, 9.5 mm in accordance with State of Louisiana Highways standards.
- C. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.03 SOURCE QUALITY CONTROL

- A. Test mix design and samples in accordance with State of Louisiana Highway standards.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 GRANULAR BASE COURSE

- A. See Section 321123.

3.03 PREPARATION - PRIMER

- A. Apply primer in accordance with manufacturer's instructions.
- B. Apply primer on aggregate base or subbase at uniform rate of 1/3 gal/sq yd (1.5 L/sq m).
- C. Use clean sand to blot excess primer.

3.04 PREPARATION - TACK COAT

- A. Apply tack coat in accordance with manufacturer's instructions.

- B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd (1.5 L/sq m).

3.05 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch (6 mm) measured with 10 foot (3 m) straight edge.
- B. Variation from True Elevation: Within 1/2 inch (12 mm).

3.06 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for quality control.
- B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.07 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury for 24 hours or until surface temperature is less than 140 degrees F (60 degrees C).

END OF SECTION

SECTION 321313
CONCRETE PAVING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Concrete sidewalks.

1.02 RELATED REQUIREMENTS

- A. Section 031000 - Concrete Forming and Accessories.
- B. Section 033000 - Cast-in-Place Concrete for concrete reinforcing.

1.03 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Concrete Construction; 2020.
- B. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- C. ACI 305R - Guide to Hot Weather Concreting; 2020.
- D. ACI 306R - Guide to Cold Weather Concreting; 2016.
- E. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2024.
- F. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on joint filler, admixtures, and curing compound.

PART 2 PRODUCTS**2.01 PAVING ASSEMBLIES**

- A. Comply with applicable requirements of ACI 301.

2.02 FORM MATERIALS

- A. Form Materials: As specified in Section 031000, comply with ACI 301.

2.03 REINFORCEMENT

- A. Reinforcing Steel and Welded Wire Reinforcement: Types specified in Section 032000.

2.04 CONCRETE MATERIALS

- A. Concrete: Class B, MDOT Specifications

2.05 ACCESSORIES

- A. Curing Compound: ASTM C309, Type 1, Class A.
- B. Joint Filler: Bituminous, 1/2-inch thick, AASHTO M-213.
- C. Joint Sealant: Lion D-200, or equal.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

- A. See Section 321123 for construction of base course for work of this Section.

3.03 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 REINFORCEMENT

- A. Place reinforcement as indicated.

3.05 COLD AND HOT WEATHER CONCRETING

- A. Follow recommendations of ACI 305R when concreting during hot weather.
- B. Follow recommendations of ACI 306R when concreting during cold weather.
- C. Do not place concrete when base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

3.06 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.
- C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- D. Apply surface retarder to all exposed surfaces in accordance with manufacturer's instructions.

3.07 JOINTS

- A. Align curb, gutter, and sidewalk joints.
- B. Place 3/8 inch (10 mm) wide expansion joints at 40 foot (12 m) intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
 - 1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch (13 mm) of finished surface.
 - 2. Secure to resist movement by wet concrete.
- C. Provide scored joints as indicated.
- D. Provide keyed joints as indicated.
- E. Saw cut contraction joints 3/16 inch (5 mm) wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.08 FINISHING

- A. Area Paving: Light broom, texture perpendicular to pavement direction.
- B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius (6 mm radius).
- C. Curbs and Gutters: Light broom, texture parallel to pavement direction.
- D. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.09 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/4 inch (6 mm) in 10 ft (3 m).

3.10 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.
 - 1. Provide free access to concrete operations at project site and cooperate with appointed firm.
 - 2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
 - 3. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd (76 cu m) or less of each class of concrete placed.

1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
2. Perform one slump test for each set of test cylinders taken.
- C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.11 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.

END OF SECTION

**SECTION 323111
GATE OPERATORS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Swinging gate operators.

1.02 REFERENCE STANDARDS

- A. ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction; 2024.
- B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- C. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- D. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- E. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicated data on operators.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, edge connections, and accessories.
- D. Field Quality Control Submittals: Field inspections.
- E. Executed warranty.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 3 years of documented experience.
- B. Gate Operator Installer Qualifications: Company with demonstrated successful experience installing similar projects and products, with minimum 3 years of documented experience.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for gate operator. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. DoorKing, Inc.; 120 S. Glasgow Ave; Inglewood, CA 90301; Toll-Free Tel: 800-826-7493; Tel: 310-645-0023; Fax: 310-641-1586; Email: ghendrix@doorking.com; Web: doorking.com.
- B. Approved Equal.
- C. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

- A. Swinging Gate Operators:
 - 1. Microprocessor based solid-state control board interacting with card readers, RF transmitters, access control systems, ticket machines, other activating devices as required, external devices (photo-eyes, contact edges) for entrapment protection and vehicle (loop) sensing systems. Control board shall include built-in close timer (1-25 seconds), dual-gate overlap feature, built-in ports for two (2) plug-in loop detectors, programming switches to set various operating modes, inherent magnetic pulse obstruction sensing reverse system. System shall employ Fail-Safe operation upon primary (AC) power outage.
 - a. Operating Type: Swing arm.

- b. Mounting: Post Mount.
 - c. Maximum Gate Weight: 700 lbs.
 - d. Maximum Gate Length: 18 feet
 - e. Horsepower Rating: Suitable for connected load.
 - f. Control Functions: Open, pause, and close.
 - g. Frame: G90 hot dipped 10 gage (0.134-inch) galvanized steel.
 - h. Maximum Open/Close Time: 15 to 17 seconds.
 - i. Fail-Safe Operation: Upon loss of primary (AC) power, system shall revert to a fail-safe mode allowing the gate to be pushed open without the use of special knowledge, keys or other releasing mechanisms.
 - j. Primary Reduction: Adjustable clutch, single cog belt drive train to worm reduction gear.
 - k. Magnetic Limit Switches: Automatic setting with no mechanical switches to set, wear out or break.
 - l. Operating Switches: Built-in power (on-off), reset and operating switches.\
 - m. Convenience Outlets: Two (2) 115 VAC for accessory transformers.
 - n. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325 and ASTM F-2200.
 - 1) Photo-electric eye (non-contact sensor) ; DoorKing p/n 8080-052 (EMX MN)
 - 2) Sensing edge (contact sensor) ; DoorKing p/n 8080-014 as required for necessary Open, Reversing, and Shadow functions.
 - o. Vehicle Sensors:
 - 1) BEA H-100 LZR Laser Sensors; p/n 8080-014 to be used for Open/Exit function for 'exiting' vehicles.
 - 2) BEA H-100 LZR Laser Sensors; p/n 8080-014 to be used for the Shadow/Obstruction function.
 - 3) BEA H-100 LZR Laser Sensors; p/n 8080-014 to be used for the outside Shadow/Obstruction function.
 - p. Mounting of Laser Vehicle Sensors:
 - 1) TORXUN LZR Vault Mounting Post
 - q. Enclosures: Polypropylene 0.125-inch texture gray.
- B. Access Control Devices:
- 1. Required Access Control Devices.
 - a. DoorKing 1808-084 Telephone Entry System or approved equal.
 - 1) DoorKing p/n 1800-080 Cellular Dialer for Voice Communication.
 - 2) DoorKing p/n 1200-045 pad-mounted bolt-down mounting post.
 - b. DoorKing 1836-350 Long Range Tag Reader with Standard 26bit wiegand output.
 - 1) DoorKing Model 1815-350 Long Range Tag Reader[25'range]; includes the reader mounting bracket and the Reader Interface box which outputs the 26 bit wiegand output for ACS panels. *Always check for compatibility of intended panel. Bracket fits posts/pipes 1.5" – 3"diameter.*
 - c. DoorKing p/n 1508-195 Windsheild/Headlight Tag; Qty of 200
 - d. Fire Department Access Device; as mandated by Local Authority Having Jursidiction.

PART 3 EXECUTION

3.01 INSTALLATION

- A. It is preferred that this product be installed by a qualified gate operator technician who is certified by the Institute of Dealer Education and Accreditation (IDEA) or the American Fence Association (AFA).
- B. Gate operator shall be mounted, firmly secured, plumb and level, as required.
- C. Wiring shall be uniform and in accordance with national electric codes and manufacturer's instruction
- D. All splices shall be in easily accessible junction boxes or on terminal boards.
- E. All cable runs in all junction boxes shall be tagged and identified.
- F. Coordinate all work with other effected trades and contractors.

3.02 SYSTEM INITIALIZING AND PROGRAMMING

- A. System shall be turned on and adjustment made to meet requirements of specifications and on-site conditions.
- B. System shall function as specified.

3.03 SYSTEM TEST PROCEDURES

- A. System shall be completely tested to assure that all components and accessories are hooked-up and in working order.
- B. System shall be pre-tested by contractor and certified to function in accordance with plans and specifications.
- C. System shall be tested in presence of owner's representative.

3.04 OWNER INSTRUCTIONS

- A. Installation contractor shall conduct up to (1) hour of instruction in use and operation of the system to designated owner representatives, within (30) days of acceptance.
- B. Installation contractor shall conduct up to (1) hour of technical training, in troubleshooting and service of the system, to designated owner representatives within (90) days of system acceptance.

3.05 MANUALS AND DRAWINGS

- A. Contractor shall provide owner with (2) copies of standard factory prepared operation, installation and maintenance manuals. Manuals shall include typical wiring diagrams.
- B. Contractor shall provide owner with (2) copies of any risers, layouts, and special wiring diagrams showing any changes to standard drawings, if required on project.

3.06 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Perform three random field inspections confirming installation.

3.07 MAINTENANCE

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Provide separate maintenance contract for service and maintenance for three years from Date of Substantial Completion.

END OF SECTION

**SECTION 323113
CHAIN LINK FENCES AND GATES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Posts, rails, and frames.
- B. Wire fabric.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete anchorage for posts.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a (Reapproved 2022).
- D. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric; 2011 (Reapproved 2022).
- E. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2023.
- F. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2018 (Reapproved 2022).
- G. CLFMI CLF-SFR0111 - Security Fencing Recommendations; 2014.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.
- C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

PART 2 PRODUCTS**2.01 MATERIALS, COMPONENTS, FINISHES AND INSTALLATION**

- A. All tubular members will comply with provisions of ASTM F 1083. Standard weight, schedule 40 galvanized steel pipe in accordance with heavy industrial requirements of ASTM F669 Group IA with minimum yield strengths of 25,000 psi, not less than 1.8 oz of zinc per square foot. Type A coating inside and outside according to ASTM F 1234 as determined by ASTM A 90, and weight per foot.
- B. End, Corner, Gate and Pull Post will be 2 - 1/2" (2 - 7/8" OD) Schedule 40 pipe
- C. Line post will be 2" (2 - 3/8" OD) Schedule 40 pipe.
- D. Gate Frame Post will be 1 - 1/4" (1 - 5/8" OD) Schedule 40 pipe.
- E. Top Rail post will be 1 - 1/4" (1 - 5/8" OD) Schedule 40 pipe.
- F. Bracing will be 1 - 1/4" (1 - 5/8" OD) Schedule 40 pipe.
- G. All fabric will be 2 inch mesh, 0.148 inch diameter, 9 gage. Coating to be ASTM A 817, Type 2 zinc coated (galvanized) after weaving, 2.0 oz. of zinc per square foot, one piece width, 8' in height above deck, to comply with Chain Link Fence Manufacturers Institute (CLFMI) "Product manual."
- H. Selvage edges will be knuckled at the bottom and twisted and barbed at top.

- I. Install bracing (see 2.8) for all corner posts in both directions (one direction at gates) and at all gate posts back to nearest intermediate or corner posts.
- J. All gate and intermediate line post will have a 6" X 6" x 1/4" galvanized plate minimum welded to bottom for anchoring to floor. Corner post plate will be 8" X 8" x 1/4". Galvanizing is to be done after welding and drilling of holes for anchor bolts. Use 1/2" stainless steel anchor bolts, nuts and washers for securing the plates to the deck in four places. Maintain approximately 1/2" air gap below post plates.
- K. Gates will be provided with horizontal and vertical members as necessary to ensure proper gate operation and attachment of fabric, hardware, and accessories. Fabric will be the same as used on the fence. Secure fabric at vertical edges with tension bars and bands and to the top and bottom of frame with tie wires.
- L. Gate frame will be hot-dipped galvanized after fabrication.
- M. The gate hinge will allow 180 degrees movement and will have an outward swing. Hinges are to be galvanized malleable or pressed steel.
- N. Gate will have a locking chain, straight link, 1/4" galvanized steel, welded, size 5/0. Chain to be one piece inserted between gate frame and tension bar such that the chain will accept a lock from outside the gate. The chain is to be installed such that a tight fit is obtained with lock installed and excess links will be removed. Stretcher bars are to be 3/16" X 3/4" flat galvanized bars and will be attached to post at 15" minimum intervals.
- O. Bottom of fence is to be a maximum of 2" to finish floor.
- P. Tie wire is to be 6 gage aluminum and shall be used to fasten fabric to posts, bracing, top rail etc. and will be placed at a minimum interval of 24".
- Q. Unless otherwise specified, hot dipped galvanized pressed steel or cast iron fence fitting and accessories with at least 2 oz of zinc per sq. ft as determined by ASTM 90 will be used.
- R. Provide and install weather tight closure caps for each post above skid deck and is not required below skid deck.
- S. Line posts are to be placed at a maximum of 10 feet o.c. unless otherwise directed.
- T. Bottom tension wire is to be # 7 gauge Class 3 coating.
- U. Tension bands will be 3/4" wide minimum hot dipped galvanized steel with a minimum of 2 oz of zinc coating per sq. ft and shall be 0.074 inch thick (14 gage) minimum.
- V. Brace bands will be 3/4" wide minimum hot dipped galvanized steel with a minimum of 2 oz of zinc coating per sq. ft and shall be 0.103 inch thick (13 gage) minimum.

2.02 ACCESSORIES

- A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.
- B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

2.03 FINISHES

- A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 1.7 ounces per square foot (530 g/sq m).
- B. Accessories: Same finish as framing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that areas are clear of obstructions or debris.

3.02 PREPARATION

- A. Removal: Obstructions or debris.

3.03 INSTALLATION

- A. Install framework, fabric, accessories and gates in accordance with ASTM F567.
- B. Place fabric on outside of posts and rails.

- C. Set intermediate posts plumb . Slope top of concrete for water runoff.
- D. Line Post Footing Depth Below Finish Grade: ASTM F567.
- E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.
- F. Brace each gate and corner post to adjacent line post with horizontal center brace rail. Install brace rail one bay from end and gate posts.
- G. Provide top rail through line post tops and splice with 6 inch (150 mm) long rail sleeves.
- H. Stretch fabric between terminal posts or at intervals of 100 feet (30 m) maximum, whichever is less.
- I. Position bottom of fabric 2 inches (50 mm) above finished grade.
- J. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches (380 mm) on centers.
- K. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- L. Install bottom tension wire stretched taut between terminal posts.
- M. Do not attach the hinged side of gate to building wall; provide gate posts.
- N. Install hardware and gate with fabric to match fence.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm).
- B. Maximum Offset From True Position: 1 inch (25 mm).
- C. Do not infringe on adjacent property lines.

3.05 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.
- C. Gates: Inspect for level, plumb, and alignment.

3.06 CLEANING

- A. Leave immediate work area neat at end of each work day.
- B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.
- C. Clean fence with mild household detergent and clean water rinse well.
- D. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

END OF SECTION

SECTION 329223
SODDING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fertilizing.
- B. Sod installation.
- C. Maintenance.

1.02 RELATED REQUIREMENTS

- A. Section 312200 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

1.03 DEFINITIONS

- A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 REFERENCE STANDARDS

- A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding; 2006.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Certificate: Certify grass species and location of sod source.
- C. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer .

1.06 QUALITY ASSURANCE

- A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience, and certified by the State of Mississippi.
- B. Installer Qualifications: Company approved by the sod producer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sod on pallets. Protect exposed roots from dehydration.
- B. Do not deliver more sod than can be laid within 24 hours.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Sod: TPI (SPEC), Certified Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft (100 sq m). Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.
 - 1. Eremochloa ophiuroides (Centipede) Grass Type: 98 percent.
- B. Topsoil: See Section 312200
- C. Fertilizer: Organic, granular controlled release fertilizer; recommended for grass, with equal percentages of nitrogen, phosphoric acid, and potassium.
- D. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

2.02 SOURCE QUALITY CONTROL

- A. Provide analysis of topsoil fill under provisions of Section 014000.
- B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

- C. Submit minimum 10 oz (280 g) sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.
- D. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this section.

3.02 PREPARATION

- A. Prepare subgrade in accordance with Section 312200.
- B. Place topsoil in accordance with Section 312200.

3.03 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to installation of sod.
- C. Apply fertilizer no more than 48 hours before laying sod.
- D. Mix thoroughly into upper 2 inches (50 mm) of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.04 LAYING SOD

- A. Moisten prepared surface immediately prior to laying sod.
- B. Lay sod immediately after delivery to site to prevent deterioration.
- C. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches (300 mm) minimum. Do not stretch or overlap sod pieces.
- D. Where new sod adjoins existing grass areas, align top surfaces.
- E. Where sod is placed adjacent to hard surfaces, such as curbs, pavements, etc., place top elevation of sod 1/2 inch (13 mm) below top of hard surface.
- F. Water sodded areas immediately after installation. Saturate sod to 4 inches (100 mm) of soil.
- G. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding 90 lbs. (Roll sodded areas with roller not exceeding ____ kg.) for each foot of roller width.

3.05 MAINTENANCE

- A. Provide maintenance at no extra cost to Owner; Owner will pay for water.
- B. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches (65 mm). Do not cut more than 1/3 of grass blade at any one mowing.
- C. Neatly trim edges and hand clip where necessary.
- D. Immediately remove clippings after mowing and trimming.
- E. Water to prevent grass and soil from drying out.
- F. Roll surface to remove irregularities.
- G. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- H. Immediately replace sod to areas that show deterioration or bare spots.
- I. Protect sodded areas with warning signs during maintenance period.

END OF SECTION

**SECTION 321723.13
PAINTED PAVEMENT MARKINGS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Parking lot markings, including parking bays, crosswalks, arrows, handicapped symbols, and curb markings.

1.02 RELATED REQUIREMENTS

- A. Section 321216 - Asphalt Paving.
- B. Section 321726 - Tactile Warning Surfacing: Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

1.03 REFERENCE STANDARDS

- A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- B. FHWA MUTCD - Manual on Uniform Traffic Control Devices; 2023.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Paint: 2 containers, 1 gallon (4 liter) size, of each type and color.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Line and Zone Marking Paint: MPI (APL) No. 97 Latex Traffic Marking Paint; color(s) as indicated.
 - 1. Parking Lots: White.
 - 2. Handicapped Symbols and Parking Spaces: Blue.
- B. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Engineer/Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Clean surfaces thoroughly prior to installation.
 - 1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.

- D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.
- E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.
- F. Temporary Pavement Markings: When required or directed by Engineer/Architect, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
 - 1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
 - 2. At Contractor's option, temporary marking tape may be used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.

3.03 INSTALLATION

- A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.
- B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F (10 degrees C) or more than 95 degrees F (35 degrees C).
- C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.
- D. Comply with FHWA MUTCD manual (<http://mutcd.fhwa.dot.gov>) for details not shown.
- E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.
- F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on drawings true, sharp edges and ends.
 - 1. Apply paint in one coat only.
 - 2. Wet Film Thickness: 0.015 inch (0.4 mm), minimum.
 - 3. Width Tolerance: Plus or minus 1/8 inch (3 mm).
- G. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
 - 1. Mark the International Handicapped Symbol at indicated parking spaces.
 - 2. Hand application by pneumatic spray is acceptable.
- H. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

END OF SECTION

SECTION 331416
SITE WATER UTILITY DISTRIBUTION PIPING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Water pipe for site conveyance lines.
- B. Pipe valves.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete for thrust restraints.
- B. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.
- C. Section 330110.58 - Disinfection of Water Utility Piping Systems: Disinfection of site service utility water piping.

1.03 REFERENCE STANDARDS

- A. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.
- B. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2024.
- C. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2024.
- D. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020 (Reapproved 2024).
- E. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 2019 (Reapproved 2025).
- F. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.
- G. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; 2023.
- H. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1500 mm); 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.
- C. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with utility company requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS**2.01 WATER PIPE**

- A. PVC Pipe: ASTM D1785 Schedule 80.
 - 1. Fittings: ASTM D2466, PVC.

2. Joints: ASTM D2855, solvent weld.
- B. PVC Pipe: AWWA C900 Class 100:
 1. Fittings: AWWA C111/A21.11, Schedule 40 per ASTM D2466 or schedule 80 per ASTM D2467.
 2. Joints: ASTM D3139 compression gasket ring.
- C. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service" in large letters.

2.02 VALVES

- A. Gate Valves Up To 3 Inches (75 mm):
 1. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression ends, with control rod, post indicator, valve key, and extension box.
- B. Gate Valves 3 Inches (75 mm) and Over:
 1. AWWA C509, iron body, bronze trim, non-rising stem with square nut, single wedge, resilient seat, flanged ends, control rod, post indicator, valve key, and extension box.

2.03 BEDDING AND BACKFILL MATERIALS

- A. Bedding: As specified in Section 312316.13.
- B. Backfill: As specified in Section 312316.13.

2.04 ACCESSORIES

- A. Concrete for Thrust Restraints: Concrete type specified in Section 033000.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.02 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

- A. See the sections on excavation and fill for additional requirements.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.
- C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION - PIPE

- A. Route pipe in straight line.
- B. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- C. Slope water pipe and position drains at low points.
- D. Install warning tape 12 inches above top of pipe; coordinate with Section 312316.13.

3.05 INSTALLATION - VALVES AND HYDRANTS

- A. Set valves on solid bearing.
- B. Center and plumb valve box over valve. Set box cover flush with finished grade.

3.06 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Perform field inspection and testing in accordance with Section 014000.
- C. Pressure test water piping to ____ pounds per square inch (____ kPa).

- D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

END OF SECTION

SECTION 333113
SITE SANITARY SEWERAGE GRAVITY PIPING

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Sanitary sewerage drainage piping, fittings, and accessories.
- B. Connection of building sanitary drainage system to municipal sewers.

1.02 RELATED REQUIREMENTS

- A. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.
- B. Section 312323 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

- A. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2025.
- B. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2024, with Editorial Revision (2025).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating pipe, pipe accessories.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- D. Project Record Documents:
 - 1. Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
 - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 PRODUCTS**2.01 SEWER PIPE MATERIALS**

- A. Provide products that comply with applicable code(s).
- B. Plastic Pipe: ASTM D3034, Type PSM, SDR 26, Poly(Vinyl Chloride) (PVC) material; minimum inside nominal diameter of 6 inches (____ mm), bell and spigot style solvent sealed joint end.
- C. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.02 PIPE ACCESSORIES

- A. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Sewer Service" in large letters.

2.03 BEDDING AND BACKFILL MATERIALS

- A. Pipe Bedding Material: As specified in Section 312323.
- B. Pipe Backfill Material: As specified in Section 312323.

PART 3 EXECUTION**3.01 GENERAL**

- A. Perform work in accordance with applicable code(s).

3.02 TRENCHING

- A. See Section 312316.13 for additional requirements.

- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.03 INSTALLATION - PIPE

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
 - 1. Plastic Pipe: Also comply with ASTM D2321.
- C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 10 feet (3 m).
- D. Connect to building sanitary sewer outlet and municipal sewer system , through installed sleeves.
- E. Install trace wire 6 inches (150 mm) above top of pipe; coordinate with Section 312316.13.

3.04 INSTALLATION - CLEANOUTS

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated.
- D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 014000.
- B. Infiltration Test: Test in accordance with ASTM C 924.

3.06 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 334000
STORM DRAINAGE UTILITIES**PART 1 GENERAL****1.01 SUMMARY**

- A. This work shall consist of the furnishing and installation of storm drainage pipe and fittings in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans. It shall also consist of furnishing all materials and joining the work to other pipe, catch basins, inlets, etc. as may be required to complete the work as designed. The extent and location of each type of drainage piping is shown on the plans.
- B. Types of drainage piping required include the following:
 - 1. Corrugated High-Performance Polypropylene (HPP) pipe and fittings
 - 2. Polyvinyl Chloride (PVC) pipe and fittings

1.02 SUBMITTALS

- A. Product Data: For each type of product specified. Indicate products conform to specified requirements.
- B. Manufacturer's installation instructions: Indicate special procedures required to install products specified.
- C. Field quality-control test reports.
- D. Project record documents: Accurately record the following.
 - 1. Actual locations of pipe runs, connections, and invert elevations.
 - 2. Identify and describe unexpected variations to subsoil conditions and locations of uncharted utilities.

PART 2 PRODUCTS**2.01 HPP PIPE AND FITTINGS**

- A. Manufacturers
 - 1. Advanced Drainage Systems (ADS), Inc.
 - 2. Approved Equivalent
- B. Corrugated HPP pipe and fittings 12" to 60" diameter shall be ADS HP Storm piping or approved equivalent with a smooth interior and annular exterior that conforms to the requirements of ASTM F2881 and AASHTO M330.
- C. Joints for HPP pipe shall consist of a gasketed integral bell & spigot conforming to the requirements of ASTM F2881.

2.02 PVC PIPE AND FITTINGS

- A. Solid wall PVC pipe and fittings 4" to 15" shall conform to the requirements of SDR 35 and ASTM D3034.
- B. Solid wall PVC pipe and fittings 18" to 27" shall conform to the requirements of SDR 35 and ASTM F679.
- C. All PVC pipe and fittings shall be bell end with couplings designed for making PVC joints using elastomeric gaskets to affect the pressure seal.

2.03 STORM DRAINAGE STRUCTURES

- A. Provide Storm Drainage Structures per details shown on the Drawings.

2.04 FILTER CLOTH

- A. Joints for reinforce concrete pipe and HPP pipe shall be wrapped with filter/drainage fabric as specified in Section 312323.

PART 3 EXECUTION**3.01 EXCAVATION**

- A. Excavation shall include the loosening, loading, removing, transporting and disposing of all materials, wet or dry, above or below ground, within the allowable limits, necessary to be removed to install all drainage piping included in this contract to the lines, grades and dimensions specified on the plans and as otherwise required in the specifications.
- B. Excavation shall be incidental and included in the cost of the pipe.

- C. The maximum allowable trench width at the ground or pavement surface and at the bottom of the trench shall be within the limits detailed on the plans. Over digging is not permitted unless authorized by the Architect or Engineer.
- D. Contractor shall, at his own expense, furnish and install all temporary sheeting, timbering, and bracing required to maintain the excavation in a condition to furnish safe working conditions and to permit the safe and efficient installation of all drainage piping. Contractor shall further, at his own expense, shore up or otherwise protect all fences, buildings, walls, walks, curbs, or other property adjacent to any excavation which might be disturbed during the progress of the work. Temporary supports must be removed by the Contractor at his own expense after or concurrently with the completion of the drainage work.
- E. Contractor shall, at his own expense, do all ditching, pumping, well pointing, and bailing, build all drains, and do all other work necessary to keep the excavation clear of ground water, sewage, or storm water during the progress of the work, and until the finished work is safe from injury. Where the excavation is wet sand, Contractor shall install and operate, at his own expense, a pumping system connected with well points, so as to drain the same effectually. All well point holes shall be backfilled with sand after removal. All water pumped or drained from the work shall be disposed of in a manner that will not damage adjacent property or other work under construction. Necessary precautions shall be taken to protect all construction against flooding.

3.02 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at the downstream end, true to grades and alignment indicated on the plans. The lower segment of the pipe shall be in contact with the shaped bedding material throughout the pipe's full length. Place bell ends of piping facing upstream.
- C. Clear interior of piping of dirt and superfluous material as work progresses. Cover all openings in to the system as it is being installed to prevent obstructions in the pipe.

3.03 PIPE JOINT CONSTRUCTION

- A. Comply with joint seal manufacturer's written instructions to supply a soil tight joint. Ends shall be clean and dry and fully entered.
- B. Wrap reinforced concrete pipe and HDPE pipe joints with filter cloth as detailed in the plans.

3.04 PIPE EMBEDMENT AND BACKFILL

- A. Embedment of pipe and placement of backfill shall proceed as detailed in the plans and in accordance with Section 312316.13.

3.05 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - 2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 3. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to requirements of authorities having jurisdiction.

3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.

END OF SECTION

SECTION 330110.58
DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Disinfection of site domestic water lines and site fire water lines specified in Section 331416.

1.02 RELATED REQUIREMENTS

- A. Section 331416 - Site Water Utility Distribution Piping.

1.03 REFERENCE STANDARDS

- A. AWWA B300 - Hypochlorites; 2024.
- B. AWWA B301 - Liquid Chlorine; 2024.
- C. AWWA B302 - Ammonium Sulfate; 2023.
- D. AWWA B303 - Sodium Chlorite; 2024.
- E. AWWA C651 - Disinfecting Water Mains; 2023.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Test Reports: Indicate results comparative to specified requirements.
- C. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.
- D. Disinfection report:
 - 1. Type and form of disinfectant used.
 - 2. Date and time of disinfectant injection start and time of completion.
 - 3. Test locations.
 - 4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
 - 5. Date and time of flushing start and completion.
 - 6. Disinfectant residual after flushing in ppm for each outlet tested.
- E. Bacteriological report:
 - 1. Date issued, project name, and testing laboratory name, address, and telephone number.
 - 2. Time and date of water sample collection.
 - 3. Name of person collecting samples.
 - 4. Test locations.
 - 5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
 - 6. Coliform bacteria test results for each outlet tested.
 - 7. Certification that water conforms, or fails to conform, to bacterial standards of Mississippi State Department of Health.

1.05 QUALITY ASSURANCE

- A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.
- B. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of the State in which the Project is located.
- C. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS**2.01 DISINFECTION CHEMICALS**

- A. Chemicals: AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate, AWWA B303 Sodium Chlorite, AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate, AWWA B303 Sodium Chlorite, AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate, AWWA B303 Sodium Chlorite, AWWA B300

Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate, and AWWA B303 Sodium Chlorite.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping system has been cleaned, inspected, and pressure tested.
- B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

- A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.
- B. Provide and attach equipment required to perform the work.
- C. Inject treatment disinfectant into piping system.
- D. Maintain disinfectant in system for 24 hours.
- E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.
- F. Replace permanent system devices removed for disinfection.
- G. Pressure test system to a minimum of 100 psi (____ kPa). Repair leaks and re-test.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 014000.
- B. Test samples in accordance with AWWA C651.

END OF SECTION