THE HOUSING AUTHORITY OF THE CITY OF AUGUSTA, GEORGIA

SERVING AUGUSTA'S HOUSING

NEEDS SINCE 1937

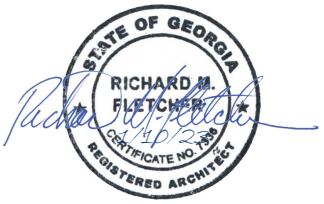
Project Manual for:

Comprehensive Modernization of

Ervin Towers, GA001000072,

Augusta, Georgia

DATED: January 10, 2023



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The Housing Authority of the City of Augusta, Georgia
January 10, 2023

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PROJECT DIRECTORY

Owner

The Augusta Housing Authority
1435 Walton Way
Augusta, GA 30901
POC: Dr. Gregory Francisco, Director of Planning & Development
706.312.3165
gfrancisco@augustapha.org

Architect

Cheatham Fletcher Scott Architects + Designers
420 ½ Eighth Street
Augusta, GA 30901
POC: Meagan Denton, Project Architect
706.724.2668
meagand@cfsarchitects.com

Structural Engineer

J.E. Stewart Engineering
237 Chesterfield Street
Aiken, SC 29801
POC: Josh Stewart
803.648.4605
@josh@jestewartengineering.com

Plumbing Engineer

PFA Engineering
1201 Broad Street, Suite 3A
Augusta, GA 30901
POC: Joe Powell
706.722.3959
jpowell@pfaengineers.com

HVAC Engineer

PFA Engineering
1201 Broad Street, Suite 3A
Augusta, GA 30901
POC: Daniel McAlister
706.722.3959
dmcalister@pfaengineers.com

Electrical Engineer

Electrical Design Consultants
1201 Broad Street, Suite 1A
Augusta, GA 30901
POC: Michael Mongrue
706.724.3551
mmongrue@edcaugusta.com

Invitation for Bids

The Housing Authority of The City of Augusta, Georgia will receive Bids in the J. Madden Reid Administration Building, 1435 Walton Way, Augusta, Georgia 30901 until 2:00 P.M., (local time) in Augusta, Georgia on Tuesday, January 17, 2023, for The Comprehensive Modernization of Ervin Towers, GA001000072, Augusta, Ga, 30901. At the time and place noted above, the bids will be publicly opened and read aloud. All bids will be evaluated as to quality and completeness of the bid package.

Contract documents, including all drawings and specifications, are on file at the office of The Housing Authority of The City of Augusta, Georgia, 1435 Walton Way, and at the offices of Cheatham Fletcher Scott Architects + Designers, 420 ½ Eighth Street Augusta, GA 30901. To obtain a link for downloading the bid documents, send a request to info1@cfsarchitects.com. No printed drawings or specifications will be provided, however, once documents are downloaded, bidders may print sets as needed. No deposit or fee will be required.

Bidders are requested to inspect the property as well as operations and conditions that may be affected. Arrangements shall be made for inspecting the site by contacting the Housing Authority at (706) 312-3162 (Mr. Jason Easler, Operations Manager of Planning and Development) or (706) 312-3165 (Dr. Gregory Francisco, Director of Planning and Development).

~~A pre-bid meeting and inspection will be held in the Board Room of the Madden Reid Building, 1435 Walton Way, Augusta, GA 30901 on Wednesday, January 4, 2022 @ 10 A.M.(Local Time). All prospective bidders are urged to attend. Non-Attendance on the part of the bidder shall not relieve the bidder of any responsibility for adherence to any provisions of this bid package or any addenda thereto.~~ (Meeting was held before revised Bid Documents were issued.)

The Contract, if awarded, will be on the basis of the lowest base bid from a responsible bidder. No bid may be withdrawn for a period of sixty (60) days after time has been called on date of bid opening. Bids exceeding $100,000 must be accompanied by a bid bond or cashier's check, made payable to The Housing Authority of The City of Augusta, Georgia, in an amount of not less than 5% of the base bid. The Housing Authority of the City of Augusta, GA reserves the right to accept or reject any bids and to waive any informalities and technicalities in the bidding process.

The successful bidder will be required to furnish and pay for both a Performance Bond and a Payment Bond or bonds in the amount equal to 100% of the contract price along with the Builders Risk Insurance Policy and other insurance requirements in accordance with the General Conditions.

Attention is called to the provisions for equal employment opportunity and to the requirement that not less than minimum salaries and wages as set forth in the specifications must be paid on this project. The work to be performed under this contract is subject to the requirements of Section 3 of the HUD Act of 1968, as amended, 12 U.S.C.1701u (Section 3). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low-and very low-income persons, particularly persons who are recipient of HUD assistance for Housing. The Housing Authority of The City of Augusta, Georgia has established a goal of awarding 20% of the dollar value of contracts to Section 3. General

contractors may contact the Georgia Department of Labor, Veteran Outreach Program at 601 Greene Street for qualified veteran owned businesses.

The Housing Authority of The City of Augusta, Georgia

BY: Jacob L Oglesby, Executive Director

BID FORM

TO: The Housing Authority of The City of Augusta, Georgia
The J. Madden Reid Administration Building
1435 Walton Way
Augusta, Georgia 30901

RE: Comprehensive Modernization of Ervin Towers Project

Gentlemen/Ladies:

The Undersigned, having familiarized (himself/themselves) with the local conditions affecting the cost of the work, and with the specifications, the Drawings and Addenda, if any thereto, as prepared by Cheatham Fletcher Scott Augusta, Georgia, hereby proposes to furnish all labor, materials, equipment, and services required for the Comprehensive Modernization of Ervin Towers, GA001000072, Augusta, Ga, 30901, all in accordance therewith.

A TOTAL SUM OF _____
_____Dollars
($_____) which sum hereinafter called the "**Base Bid**".

ALTERNATE NO. 1 – As described in Spec Section 012300 and on the drawings, deduct all labor and materials to renovate the apartment area of Floor 10:_____
_____
_____Dollars ($_____)

ALTERNATE NO. 2 - As described in Spec Section 012300 and on the drawings, deduct all labor and materials to demolish Floor 10 and renovate the apartment area of Floor 9 (Alternate 2 will not be accepted without acceptance of Alternate 1.):_____
_____
_____Dollars ($_____)

ALTERNATE NO. 3 - As described in Spec Section 012300 and on the drawings, deduct all labor and materials to demolish Floor 9 and renovate the apartment area of Floor 8 (Alternate 3 will not be accepted without acceptance of Alternates 1 and 2.):_____
_____
_____Dollars ($_____)

ALTERNATE NO. 4 - As described in Spec Section 012300 and on the drawings, deduct all labor and materials to demolish Floor 8 and renovate the apartment area of Floor 7

 Contractor Initial_____

(Alternate 4 will not be accepted without acceptance of Alternates 1 through 3.):_____

_____

_____

_____Dollars ($_____)

ALTERNATE NO. 5 - As described in Spec Section 012300 and on the drawings, deduct all labor and materials to demolish Floor 7 and renovate the apartment area of Floor 6 (Alternate 5 will not be accepted without acceptance of Alternates 1 through 4.):_____

_____

_____

_____Dollars ($_____)

ALTERNATE NO. 6 - As described in Spec Section 012300 and on the drawings, deduct all labor and materials to demolish Floor 6 and renovate the apartment area of Floor 5 (Alternate 6 will not be accepted without acceptance of Alternates 1 through 5.):_____

_____

_____

_____Dollars ($_____)

ALTERNATE NO. 7 - As described in Spec Section 012300 and on the drawings, deduct all labor and materials to demolish Floor 5 and renovate the apartment area of Floor 4 (Alternate 7 will not be accepted without acceptance of Alternates 1 through 6.):_____

_____

_____

_____Dollars ($_____)

ALTERNATE NO. 8 - As described in Spec Section 012300 and on the drawings, deduct all labor and materials to demolish Floor 4 and renovate the apartment area of Floor 3 (Alternate 8 will not be accepted without acceptance of Alternates 1 through 7.):_____

_____

_____

_____Dollars ($_____)

ALTERNATE NO. 9 - As described in Spec Section 012300 and on the drawings, deduct all labor and materials to demolish Floor 3 and renovate the apartment area of Floor 2 (Alternate 9 will not be accepted without acceptance of Alternates 1 through 8.):_____

_____

_____

_____Dollars ($_____)

Contractor Initial_____

ALTERNATE NO. 10 - deduct all labor and materials to install service elevator car, doors, rails, motors, hoistway equipment, and controls for a complete, functioning elevator in accordance with the drawings and specification section 142123.16. (Base bid shall include construction of elevator shaft, hoist beam, door frames, pit, conduits, and drain complete and ready for elevator installation.)

_____

_____Dollars ($_____)

The Undersigned agrees to commence actual physical work, on site, with an adequate force and equipment within ten (10) days following a date to be specified in a written order to proceed, issued by the Owner and to substantially complete all work within **550** calendar days from and including said date.

In submitting the Bid, it is understood that the right is reserved by The Housing Authority of The City of Augusta, Georgia to reject any and all bids. If written notice of the acceptance of this Bid is mailed or delivered to the Undersigned within 60 days after the opening thereof, or at any time thereafter before this bid is withdrawn, the Undersigned agrees to execute and deliver a Contract in the prescribed form and furnish the required bonds within ten (10) days after the Contract is presented to him for signature.

Attached hereto is an affidavit in proof that the Undersigned has not entered into any collusion with any person in respect to this proposal or any proposal of the submitting of proposals for the Contract for which this proposal is submitted.

The Bidder represents that he/she ( ) has ( ) has not participated in a previous Contract or Sub-Contract subject to the Equal Opportunity clause prescribed by Executive Orders10925, 11114, or 11246 or the Secretary of Labor; that he/she ( ) has ( ) has not filed all required compliance reports signed by proposed Sub-Contractors, will be obtained prior to Sub-Contractor awards. (The above representation need not be submitted in connection with Contracts or Sub-Contracts, which are exempt from the clause.)

Certification of Non-Segregated Facilities: By signing this bid, the bidder certifies that he/she does not maintain or provide for his/her employees any segregated facilities at any of his/her establishments, and that he/she does not permit his/her employees to perform their services at any location under his control where segregated facilities are maintained. He/she certifies further that he/she will not maintain or provide for his/her employees any segregated facilities at any of his/her establishments, and that he/she will not permit his employees to perform their services at any location under his/her control where segregated facilities are maintained. The bidder agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in certification, the term

"segregated facilities" means any waiting rooms, work areas, restrooms and wash rooms, restaurants, and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation and housing facilities provided for employees which are segregated by explicit directive or area, in fact, segregated on the basis of race, color, religion or national origin, because of habit, local custom , or otherwise. He/she further agrees that (except where he/she has obtained identical certifications form proposed subcontractors for specific time periods) he/she will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $ 10,000.00 which are not exempt from the provisions of the Equal Opportunity clause; that he/she will forward a notice to his proposed subcontractors as provided in the instructions to bidders.

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

*RECEIPT OF THE FOLLOWING ADDENDA IS ACKNOWLEDGED.

Addendum No._______through Addendum No. _____

*Note: *Contractor shall confirm all addenda to Plans and Specifications which you acknowledge to have received.*

Federal Work Authorization User ID (E-Verify) Number: _____
****NOT TAX ID NUMBER****

DATE: _____

_____
(COMPANY NAME)

OFFICIAL ADDRESS:

_____ BY: _____

_____ TITLE: _____

_____ SIGNATURE: _____

Contractor Initial_____

*DOCUMENTS **REQUIRED** for BID:*

1. **This Bid Form & Bid Bond (include bond if bid amount is over $100,000)**
2. **Representations, Certifications and Other Statements of Bidders (HUD-5369-A)**
3. **Previous Participation Certificate (HUD 2530)**
4. **Debarment Certification**
5. **Non-Collusive Affidavit**
6. **Drug Free Certification**
7. **E-Verify Affidavits for Contractor (Affadivits for ALL Subcontractors and Sub-subcontractors shall be submitted by selected bidder prior to signing contract.)**
8. **Section 3 Final Rule Implementation Plan (Section 3 Business Utilization Plan to be submitted by selected bidder prior to signing contract.)**
9. **Build America, Buy America Certification Form**

Documents must be in a sealed envelope with contractor's name, name of project bidding on, and date of bid prominently and clearly displayed on the front.

SPECIAL NOTE: Successful bidders WILL be required to provide names and E-verify numbers of all Subcontractors, and Sub-subcontractors as well as the names of proposed suppliers (if available) within ten (10) calendar days of notification of a successful bid (and prior to signing of the Contract). Failure to do so may be cause for rejection of the Bid.

Contractor Initial_____

BID BOND

(Required for Construction Bids Exceeding $100,000)

KNOW ALL MEN BY THESE PRESENTS:

That _____ as
(Legal Name and Address of Contractor)
Principal (Hereinafter referred to as the "Principal"), and
_____ as
(Legal Title and Address of Surety)
Surety (Hereinafter referred to as the "Surety"), are held and firmly bound unto the Housing Authority of the City of Augusta, Georgia, a body politic and corporate, created by the Housing Authorities Law for the State of Georgia, the penal sum of $(_____)

_____
(Amount of Contract in Dollar Amount)
in lawful money of the United States of America, for the payment of which sum will and truly be made, we bind ourselves, our heir, executors, administrators, successors and assigns jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal has submitted the accompanying Bid, dated _____, 20____ for:

_____

_____

NOW, THEREFORE, if the Principal shall not withdraw said Bid within the period specified therein after the opening of the same, or, if no period be specified within thirty (30) days after the said opening, and shall within the period specified therefore, or, if no period be specified within ten (10) days after the prescribed forms are presented to him for signature, enter into a written contract with the Housing Authority of the City of Augusta, Georgia in accordance with the Bid as accepted, and give bond with good and sufficient Surety or Sureties, as may be required, for the faithful performance and proper fulfillment of such Contract; or in the event of the withdrawal of said Bid within the period specified, or the failure to enter into such Contract and give bond within the time specified, if the Principal shall pay the Housing Authority of the City of Augusta, Georgia the difference between the amount specified in said Bid and the amount for which the Housing Authority of the City of Augusta, Georgia may procure the required work or supplies, or both, if the latter amount be in excess of the former, then the above obligation shall be void and of no effect; otherwise to remain in force and virtue.

Contractor Initial_____

IN WITNESS WHEREOF, the above bounded parties have executed this Instrument under their several seals this _____ day of _____, 20_____, the name and corporate seal of each corporate party being hereto affixed, and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In the Presence of:

_____ _____(SEAL)
Plain Witness (Individual Principal)

_____ _____(SEAL)
Notary (Business Address)

ATTEST:

_____
(Corporate Principal)

_____ _____
Witness (Business Address)

BY:

_____
Affix Corporate Seal (Signature)

_____
(Print Name)

_____
ATTEST: (Corporate Surety)

_____ _____
Witness (Business Address)

BY:_____
(Signature)

Affix Corporate Seal

_____
(Print Name)

Contractor Initial_____

(The above is to be filled in by Surety Company, and the power of attorney of person signing for the Surety Company must be attached.)

COUNTERSIGNED: _____(Resident Agent)

_____
(Print Name of Resident Agent Above)

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the _____ of the Corporation named as Principal in the within Bond; that _____ who signed the bond on behalf of the Principal was then the _____ of said Corporation; that I know his signature, and his signature is genuine; and that the said bond was duly signed, sealed and attested for and in behalf of said Corporation by authority of its governing body.

_____
(Signature)

Affix Corporate Seal

Contractor Initial_____

DIRECTIONS FOR PREPARATION OF PERFORMANCE AND PAYMENT BOND

(Required for Construction Contracts in Excess of $100,000)

1. Individual sureties, partnerships, or corporations not in the surety business will not be acceptable.

2. The name of the Principal shall be shown exactly as it appears in the contract.

3. The penal sum shall not be less than that required in the Specifications.

4. If the Principals are partners, or joint venturers, each member shall execute bond as an individual, with his place of residence shown.

5. If the Principal is a corporation, the bond shall be executed under his corporate seal. If the corporation has no corporate seal, the fact shall be stated, in which case a scroller adhesive seal shall be affixed following the corporate seal.

6. The official character and authority of the person(s) executing the bond for the Principal, if a corporation, shall be certified by the secretary or assistant secretary thereof, under the corporate seal, or there may be attached copies of so much of the records of the corporation as will evidence the official character and authority of the officer signing, duly certified by the secretary or assistant secretary, under the corporate seal, to be the true copies.

7. The current power-of-attorney of the person signing for the surety company must be attached to the bond.

8. The date of the bond must not be prior to the date of the contract.

9. The following information must be placed on the bond by the surety company:

    a. The rate of premium in dollars per thousand, and
    b. The total dollar amount of premium charged.

10. The signature of a witness shall appear in the appropriate place, attesting to the signature of each party to the bond.

11. Type or print the <u>name underneath each signature</u> appearing on the bond.

12. An executed copy of the bond must be attached to each copy of the contract (original counterpart) intended for signing.

13. The Surety Companies executing the bonds must not only be authorized to transact business in the State of Georgia, but also must be registered and appear listed on the U. S. Treasury Department's Circular No. 570 (Most Current List).

PAYMENT BOND

(Required for Contracts in Excess of $100,000)

KNOWALL MEN BY THESE PRESENTS:

That _____as Principal

(Legal Name and Address of Contractor)

(hereinafter called the "Principal"), and

_____as Surety

(Legal Title and Address of Surety)

hereinafter referred called the Surety, are held and firmly bound unto the Housing Authority of the City of Augusta, Georgia, a body politic and corporate, created by the Housing Authorities Law for the State of Georgia, for use of the Housing Authority of the City of Augusta, Georgia, and for the use and protection of all subcontractors and all persons supplying labor, materials, machinery and equipment in the prosecution of the work in the contract referred to, in the full and just sum of $(_____)

_____

(Amount of Contract in Dollar Amount)

in lawful money of the United States of America to be paid to the Housing Authority of the City of Augusta, Georgia, its successors and assigns to which payment will and truly be made, we bind ourselves, our heir, executors, administrators, successors and assigns jointly and severally, firmly by these documents.

WHEREAS, the Principal has entered into a contract with the Housing Authority of the City of Augusta, Georgia, dated _____, 20___ for the construction and completion of

_____,

all in accordance with the Drawings, Specifications, and other documents related thereto; and

WHEREAS, it was one of the conditions of the award of the Housing Authority of the City of Augusta, Georgia, pursuant to which the contract hereinabove referred to was entered into, that these presents shall be executed.

NOW, THEREFORE, the conditions of this obligation are such that if the Principal shall in all respects fully comply with the terms and conditions of said Contract and his obligations thereunder, including the Specifications and proposals therein referred to and made a part thereof, and such alterations as may be made on such Specifications as therein provided for, and shall indemnify and save harmless the Housing Authority of the City of Augusta, Georgia, against or for all costs, expenses, damages, injury, or loss to which the Housing Authority of the City of Augusta, Georgia may be subjected by reason of wrongdoing, infringement, misconduct, want of care or skill, negligence, or default, including patent infringement, on the part of the Principal, his agents or employees in the execution or performance of said contract, and shall promptly pay all just claims for damages or injury to the property and shall also promptly pay all just claims for all work done by subcontractors and all persons supplying labor, materials, machinery and equipment in the prosecution of the work described in the contract, this obligation is to be void.

And the Surety, for value received, hereby stipulates and agrees that no change, extension of time, or alteration or addition to the terms of the Contract for the work to be performed hereunder or the Specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the Specifications.

The undersigned Principal and Surety further agree that in each and every suit brought against the obligor upon this bond by the oblige in which the obligee shall be successful, there shall be assessed against the obligor in favor of the oblige, attorneys' fees, equal to 15% of the amount recovered which the obligor hereby expressly agrees to pay as part of the cost and expense of such suit.

The undersigned Principal and Surety do further hereby consent and yield to the jurisdiction of the State Civil Courts of Richmond County, Georgia, and shall assure and protect all subcontractors and all persons supplying labor,materials, machinery and equipment in prosecution of their work, all as required by applicable law.

This bond shall be for use of the Housing Authority of the City of Augusta, Georgia, and for use of all subcontractors and all persons supplying labor, materials, machinery and equipment in the prosecution of the contract herein referred to.

IN WITNESS WHEREOF, the Principal and the Surety have caused these presents to be duly signed and sealed this _____ day of _____, 20_____.

In the Presence of:

_____ _____(SEAL)

Plain Witness (Individual Principal)

_____ _____(SEAL)

Notary (Business Address)

ATTEST: _____

(Corporate Principal)

_____ _____

Witness (Business Address)

BY:_____

(Signature)

Affix Corporate Seal

_____

(Print Name)

ATTEST: _____

(Corporate Surety)

_____ _____

Witness (Business Address)

BY:_____

(Signature)

Affix Corporate Seal

_____

(Print Name)

The rate of premium on this bond is $_____ per thousand.

The total amount of premium charges is $_____.

(The above is to be filled in by Surety Company, and the power of attorney of person signing for the Surety Company must be attached.)

COUNTERSIGNED: _____(Resident Agent)

_____

(Print Name of Resident Agent Above)

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the _____ of the Corporation named as Principal in the within Bond; that _____ who signed the bond on behalf of the Principal was then the _____ of said Corporation; that I know his signature, and his signature is genuine; and that the said bond was duly signed, sealed and attested for and in behalf of said Corporation by authority of its governing body.

_____

(Signature)

Affix Corporate Seal

PERFORMANCE BOND

(Required for Contracts in Excess of $100,000)

KNOW ALL MEN BY THESE PRESENTS:

That _____as Principal

(Legal Name and Address of Contractor)

(hereinafter called the "Principal"), and

_____as Surety

(Legal Title and Address of Surety)

hereinafter referred called the Surety, are held and firmly bound unto the Housing Authority of the City of Augusta, Georgia, a body politic and corporate, created by the Housing Authorities Law for the State of Georgia, for use of the Housing Authority of the City of Augusta, Georgia, in the full and just sum of $(_____)

(Amount of Contract in Dollar Amount)

in lawful money of the United States of America to be paid to the Housing Authority of the City of Augusta, Georgia, its successors and assigns to which payment will and truly be made, we bind ourselves, our heir, executors, administrators, successors and assigns jointly and severally, firmly by these documents.

WHEREAS, the Principal has entered into a contract with the Housing Authority of the City of Augusta, Georgia, dated _____, 20___ for the construction and completion of

_____, all

in accordance with the Drawings, Specifications, and other documents related thereto; and

WHEREAS, it was one of the conditions of the award of the Housing Authority of the City of Augusta, Georgia, pursuant to which the contract hereinabove referred to was entered into, that these presents shall be executed.

NOW, THEREFORE, the conditions of this obligation are such that if the Principal shall in all respects fully comply with the terms and conditions of said Contract and his obligations thereunder, including the Specifications and proposals therein referred to and made a part thereof, and such alterations as may be made on such Specifications as therein provided for, and shall indemnify and save harmless the Housing Authority of the City of Augusta, Georgia, against or for all costs, expenses, damages, injury, or loss to which the Housing Authority of the City of Augusta, Georgia may be subjected by reason of wrongdoing, infringement, misconduct, want of care or skill, negligence, or default, including patent infringement, on the part of the Principal, his agents or employees in the execution or performance of said contract, this obligation is to be void.

And the Surety, for value received, hereby stipulates and agrees that no change, extension of time, or alteration or addition to the terms of the Contract for the work to be performed hereunder or the

Specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the Specifications.

The undersigned Principal and Surety further agree that in each and every suit brought against the obligor upon this bond by the oblige in which the obligee shall be successful, there shall be assessed against the obligor in favor of the oblige, attorneys' fees, equal to 15% of the amount recovered which the obligor hereby expressly agrees to pay as part of the cost and expense of such suit.

The undersigned Principal and Surety do further hereby consent and yield to the jurisdiction of the State Civil Courts of Richmond County, Georgia, and shall assure all undertakings under said agreement or Contract.

IN WITNESS WHEREOF, the Principal and the Surety have caused these presents to be duly signed and sealed this _____ day of _____, 20_____.

In the Presence of:

_____ _____(SEAL)
Plain Witness (Individual Principal)

_____ _____(SEAL)
Notary (Business Address)

ATTEST: _____
(Corporate Principal)

_____ _____
Witness (Business Address)

BY: _____
(Signature)

Affix Corporate Seal

_____
(Print Name)

ATTEST: _____

(Corporate Surety)

_____ _____

Witness (Business Address)

BY: _____

(Signature)

Affix Corporate Seal

_____

(Print Name)

The rate of premium on this bond is $_____ per thousand.

The total amount of premium charges is $_____.

(The above is to be filled in by Surety Company, and the power of attorney of person signing for the Surety Company must be attached.)

COUNTERSIGNED: _____ (Resident Agent)

_____

(Print Name of Resident Agent Above)

.

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the _____ of the Corporation named as Principal in the within Bond; that _____ who signed the bond on behalf of the Principal was then the _____ of said Corporation; that I know his signature, and his signature is genuine; and that the said bond was duly signed, sealed and attested for and in behalf of said Corporation by authority of its governing body.

_____

(Signature)

Affix Corporate Seal

General Conditions for Construction Contracts - Public Housing Programs

U.S. Department of Housing and Urban Development
Office of Public and Indian Housing
OMB Approval No. 2577-0157 (exp. 11/30/2023)

Applicability. This form is applicable to any construction/development contract greater than $250,000.

Public reporting burden for this collection of information is estimated to average 1 hour. This includes the time for collecting, reviewing, and reporting the data. The information requested is required to obtain a benefit. This form includes those clauses required by OMB's common rule on grantee procurement, implemented at HUD in 2 CFR 200, and those requirements set forth in Section 3 of the Housing and Urban Development Act of 1968 and its amendment by the Housing and Community Development Act of 1992, implemented by HUD at 24 CFR Part 75. The form is required for construction contracts awarded by Public Housing Agencies (PHAs). The form is used by Housing Authorities in solicitations to provide necessary contract clauses. If the form were not used, PHAs would be unable to enforce their contracts. There are no assurances of confidentiality. HUD may not conduct or sponsor, and an applicant is not required to respond to a collection of information unless it displays a currently valid OMB control number.

1. Definitions

(a) "Architect" means the person or other entity engaged by the PHA to perform architectural, engineering, design, and other services related to the work as provided for in the contract. When a PHA uses an engineer to act in this capacity, the terms "architect" and "engineer" shall be synonymous. The Architect shall serve as a technical representative of the Contracting Officer. The Architect's authority is as set forth elsewhere in this contract.

(b) "Contract" means the contract entered into between the PHA and the Contractor. It includes the forms of Bid, the Bid Bond, the Performance and Payment Bond or Bonds or other assurance of completion, the Certifications, Representations, and Other Statements of Bidders (form HUD-5370), these General Conditions of the Contract for Construction (form HUD-5370), the applicable wage rate determinations from the U.S. Department of Labor, any special conditions included elsewhere in the contract, the specifications, and drawings. It includes all formal changes to any of those documents by addendum, change order, or other modification.

(c) "Contracting Officer" means the person delegated the authority by the PHA to enter into, administer, and/or terminate this contract and designated as such in writing to the Contractor. The term includes any successor Contracting Officer and any duly authorized representative of the Contracting Officer also designated in writing. The Contracting Officer shall be deemed the authorized agent of the PHA in all dealings with the Contractor.

(d) "Contractor" means the person or other entity entering into the contract with the PHA to perform all of the work required under the contract.

(e) "Drawings" means the drawings enumerated in the schedule of drawings contained in the Specifications and as described in the contract clause entitled Specifications and Drawings for Construction herein.

(f) "HUD" means the United States of America acting through the Department of Housing and Urban Development including the Secretary, or any other person designated to act on its behalf. HUD has agreed, subject to Annual Contributions Terms and Conditions (ACC), to provide financial assistance to the PHA, which includes assistance in financing the work to be performed under this contract. As defined elsewhere in these General Conditions or the contract documents, the determination of HUD may be required to authorize changes in the work or for release of funds to the PHA for payment to the Contractor. Notwithstanding HUD's role, nothing in this contract shall be construed to create any contractual relationship between the Contractor and HUD.

(g) "Project" means the entire project, whether construction or rehabilitation, the work for which is provided for in whole or in part under this contract.

(h) "PHA" means the Public Housing Agency organized under applicable state laws which is a party to this contract.

(j) "Specifications" means the written description of the technical requirements for construction and includes the criteria and tests for determining whether the requirements are met.

(l) "Work" means materials, workmanship, and manufacture and fabrication of components.

2. Contractor's Responsibility for Work

(a) The Contractor shall furnish all necessary labor, materials, tools, equipment, and transportation necessary for performance of the work. The Contractor shall also furnish all necessary water, heat, light, and power not made available to the Contractor by the PHA pursuant to the clause entitled Availability and Use of Utility Services herein.

(b) The Contractor shall perform on the site, and with its own organization, work equivalent to at least [ ] (12 percent unless otherwise indicated) of the total amount of work to be performed under the order. This percentage may be reduced by a supplemental agreement to this order if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the PHA.

(c) At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the work site a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

(d) The Contractor shall be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. The Contractor shall hold and save the PHA, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.

(e) The Contractor shall lay out the work from base lines and bench marks indicated on the drawings and be responsible for all lines, levels, and measurements of all work executed under the contract. The Contractor shall verify the figures before laying out the work and will be held responsible for any error resulting from its failure to do so.

(f) The Contractor shall confine all operations (including storage of materials) on PHA premises to areas authorized or approved by the Contracting Officer.

(g) The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. After completing the work and before final inspection, the Contractor shall (1) remove from the premises all scaffolding, equipment, tools, and materials (including rejected materials) that are not the property of the PHA and all rubbish caused by its work; (2) leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer; (3) perform all specified tests; and, (4) deliver the installation in complete and operating condition.

(h) The Contractor's responsibility will terminate when all work has been completed, the final inspection made, and the work accepted by the Contracting Officer. The Contractor will then be released from further obligation except as required by the warranties specified elsewhere in the contract.

3. Architect's Duties, Responsibilities, and Authority

(a) The Architect for this contract, and any successor, shall be designated in writing by the Contracting Officer.

(b) The Architect shall serve as the Contracting Officer's technical representative with respect to architectural, **Schedule** engineering, and design matters related to the work performed under the contract. The Architect may provide direction on contract performance. Such direction shall be within the scope of the contract and may not be of a nature which: (1) institutes additional work outside the scope of the contract; (2) constitutes a change as defined in the Changes clause herein; (3) causes an increase or decrease in the cost of the contract; (4) alters the Construction Progress Schedule; or (5) changes any of the other express terms or conditions of the contract.

(c) The Architect's duties and responsibilities may include but shall not be limited to:

(1) Making periodic visits to the work site, and on the basis of his/her on-site inspections, issuing written reports to the PHA which shall include all observed deficiencies. The Architect shall file a copy of the report with the Contractor's designated representative at the site;

(2) Making modifications in drawings and technical specifications and assisting the Contracting Officer in the preparation of change orders and other contract modifications for issuance by the Contracting Officer;

(3) Reviewing and making recommendations with respect to - (i) the Contractor's construction progress schedules; (ii) the Contractor's shop and detailed drawings; (iii) the machinery, mechanical and other equipment and materials or other articles proposed for use by the Contractor; and, (iv) the Contractor's price breakdown and progress payment estimates; and,

(4) Assisting in inspections, signing Certificates of Completion, and making recommendations with respect to acceptance of work completed under the contract.

4. Other Contracts

The PHA may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with PHA employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by PHA employees

Construction Requirements

5. Pre-construction Conference and Notice to Proceed

(a) Within ten calendar days of contract execution, and prior to the commencement of work, the Contractor shall attend a preconstruction conference with representatives of the PHA, its Architect, and other interested parties convened by the PHA. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract. The PHA will provide the Contractor with the date, time, and place of the conference.

(b) The contractor shall begin work upon receipt of a written Notice to Proceed from the Contracting Officer or designee. The Contractor shall not begin work prior to receiving such notice.

6. Construction Progress

(a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring labor, materials, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments or take other remedies under the contract until the Contractor submits the required schedule.

(b) The Contractor shall enter the actual progress on the chart as required by the Contracting Officer, and immediately deliver three copies of the annotated schedule to the Contracting Officer. If the Contracting Officer determines, upon the basis of inspection conducted pursuant to the clause entitled Inspection and Acceptance of Construction, herein that the Contractor is not meeting the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the PHA. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.

(c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the Contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the Default clause of this contract.

7. Site Investigation and Conditions Affecting the Work

(a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to, (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads;(3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is

reasonably ascertainable from an inspection of the site, including all exploratory work done by the PHA, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the PHA.

(b) The PHA assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the PHA. Nor does the PHA assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

8. Differing Site Conditions

(a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (2) unknown physical conditions at the site(s), of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.

(b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. Work shall not proceed at the affected site, except at the Contractor's risk, until the Contracting Officer has provided written instructions to the Contractor. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, the Contractor shall file a claim in writing to the PHA within ten days after receipt of such instructions and, in any event, before proceeding with the work. An equitable adjustment in the contract price, the delivery schedule, or both shall be made under this clause and the contract modified in writing accordingly.

(c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.

(d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

9. Specifications and Drawings for Construction

(a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

(b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by", or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

(c) Where "as shown" "as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place" that is "furnished and installed".

(d) "Shop drawings" means drawings, submitted to the PHA by the Contractor, subcontractor, or any lower tier subcontractor, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials of equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract. The PHA may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with other contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the PHA's reasons therefore. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.

(f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Architect approves any such variation and the Contracting Officer concurs, the Contracting Officer shall issue an appropriate modification to the contract, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

(g) It shall be the responsibility of the Contractor to make timely requests of the PHA for such large scale and full size drawings, color schemes, and other additional information, not already in his possession, which shall be

required in the planning and production of the work. Such requests may be submitted as the need arises, but each such request shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay.

(h) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the PHA and one set will be returned to the Contractor. As required by the Contracting Officer, the Contractor, upon completing the work under this contract, shall furnish a complete set of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the work is completed and accepted.

(i) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all shop drawings prepared by subcontractors are submitted to the Contracting Officer.

10. As-Built Drawings

(a) "As-built drawings," as used in this clause, means drawings submitted by the Contractor or subcontractor at any tier to show the construction of a particular structure or work as actually completed under the contract. "As-built drawings" shall be synonymous with "Record drawings."

(b) As required by the Contracting Officer, the Contractor shall provide the Contracting Officer accurate information to be used in the preparation of permanent as-built drawings. For this purpose, the Contractor shall record on one set of contract drawings all changes from the installations originally indicated, and record final locations of underground lines by depth from finish grade and by accurate horizontal offset distances to permanent surface improvements such as buildings, curbs, or edges of walks.

(c) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all as-built drawings prepared by subcontractors are submitted to the Contracting Officer.

11. Material and Workmanship

(a) All equipment, material, and articles furnished under this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the contract to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of, and as approved by the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.

(b) Approval of equipment and materials.

(1) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

(2) When required by the specifications or the Contracting Officer, the Contractor shall submit appropriately marked samples (and certificates related to them) for approval at the Contractor's expense, with all shipping charges prepaid. The Contractor shall label, or otherwise properly mark on the container, the material or product represented, its place of origin, the name of the producer, the Contractor's name, and the identification of the construction project for which the material or product is intended to be used.

(3) Certificates shall be submitted in triplicate, describing each sample submitted for approval and certifying that the material, equipment or accessory complies with contract requirements. The certificates shall include the name and brand of the product, name of manufacturer, and the location where produced.

(4) Approval of a sample shall not constitute a waiver of the PHA right to demand full compliance with contract requirements. Materials, equipment and accessories may be rejected for cause even though samples have been approved.

(5) Wherever materials are required to comply with recognized standards or specifications, such specifications shall be accepted as establishing the technical qualities and testing methods, but shall not govern the number of tests required to be made nor modify other contract requirements. The Contracting Officer may require laboratory test reports on items submitted for approval or may approve materials on the basis of data submitted in certificates with samples. Check tests will be made on materials delivered for use only as frequently as the Contracting Officer determines necessary to insure compliance of materials with the specifications. The Contractor will assume all costs of retesting materials which fail to meet contract requirements and/or testing materials offered in substitution for those found deficient.

(6) After approval, samples will be kept in the Project office until completion of work. They may be built into the work after a substantial quantity of the materials they represent has been built in and accepted.

(c) Requirements concerning lead-based paint. The Contractor shall comply with the requirements concerning lead-based paint contained in the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4821-4846) as implemented by 24 CFR Part 35.

12. Permits and Codes

(a) The Contractor shall give all notices and comply with all applicable laws, ordinances, codes, rules and regulations. Notwithstanding the requirement of the Contractor to comply with the drawings and specifications in the contract, all work installed shall comply with all applicable codes and regulations as amended by any

waivers. Before installing the work, the Contractor shall examine the drawings and the specifications for compliance with applicable codes and regulations bearing on the work and shall immediately report any discrepancy it may discover to the Contracting Officer. Where the requirements of the drawings and specifications fail to comply with the applicable code or regulation, the Contracting Officer shall modify the contract by change order pursuant to the clause entitled Changes herein to conform to the code or regulation.

(b) The Contractor shall secure and pay for all permits, fees, and licenses necessary for the proper execution and completion of the work. Where the PHA can arrange for the issuance of all or part of these permits, fees and licenses, without cost to the Contractor, the contract amount shall be reduced accordingly.

13. Health, Safety, and Accident Prevention

(a) In performing this contract, the Contractor shall:

(1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his/her health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;

(2) Protect the lives, health, and safety of other persons;

(3) Prevent damage to property, materials, supplies, and equipment; and,

(4) Avoid work interruptions.

(b) For these purposes, the Contractor shall:

(1) Comply with regulations and standards issued by the Secretary of Labor at 29 CFR Part 1926. Failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat. 96), 40 U.S.C. 3701 et seq.; and

(2) Include the terms of this clause in every subcontract so that such terms will be binding on each subcontractor.

(c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29 CFR Part 1904.

(d) The Contracting Officer shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.

(e) The Contractor shall be responsible for its subcontractors' compliance with the provisions of this clause. The Contractor shall take such action with respect to any subcontract as the PHA, the Secretary of Housing and Urban Development, or the Secretary of Labor shall direct as a means of enforcing such provisions.

14. Temporary Heating

The Contractor shall provide and pay for temporary heating, covering, and enclosures necessary to properly protect all work and materials against damage by dampness and cold, to dry out the work, and to facilitate the completion of the work. Any permanent heating equipment used shall be turned over to the PHA in the condition and at the time required by the specifications.

15. Availability and Use of Utility Services

(a) The PHA shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the PHA or, where the utility is produced by the PHA, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.

(b) The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges. Before final acceptance of the work by the PHA, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

16. Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements

(a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed under this contract, and which do not unreasonably interfere with the work required under this contract.

(b) The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during performance of this contract, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

(c) The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. Prior to disturbing the ground at the construction site, the Contractor shall ensure that all underground utility lines are clearly marked.

(d) The Contractor shall shore up, brace, underpin, secure, and protect as necessary all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be affected by the excavations or other operations connected with the construction of the project.

(e) Any equipment temporarily removed as a result of work under this contract shall be protected, cleaned, and replaced in the same condition as at the time of award of this contract.

(f) New work which connects to existing work shall correspond in all respects with that to which it connects and/or be similar to existing work unless otherwise required by the specifications.

(g) No structural members shall be altered or in any way weakened without the written authorization of the Contracting Officer, unless such work is clearly specified in the plans or specifications.

(h) If the removal of the existing work exposes discolored or unfinished surfaces, or work out of alignment, such surfaces shall be refinished, or the material replaced as necessary to make the continuous work uniform and harmonious. This, however, shall not be construed to require the refinishing or reconstruction of dissimilar finishes previously exposed, or finished surfaces in good condition, but in different planes or on different levels **Construction** when brought together by the removal of intervening work, unless such refinishing or reconstruction is specified in the plans or specifications.

(i) The Contractor shall give all required notices to any adjoining or adjacent property owner or other party before the commencement of any work.

(j) The Contractor shall indemnify and save harmless the PHA from any damages on account of settlement or the loss of lateral support of adjoining property, any damages from changes in topography affecting drainage, and from all loss or expense and all damages for which the PHA may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

(k) The Contractor shall repair any damage to vegetation, structures, equipment, utilities, or improvements, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

17. Temporary Buildings and Transportation of Materials

(a) Temporary buildings (e.g., storage sheds, shops, offices, sanitary facilities) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the PHA. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

(b) The Contractor shall, as directed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any federal, state, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

18. Clean Air and Water

The contactor shall comply with the Clean Air Act, as amended, 42 USC 7401 et seq., the Federal Water Pollution Control Water Act, as amended, 33 U.S.C. 1251 et seq., and standards issued pursuant thereto in the facilities in which this contract is to be performed.

19. Energy Efficiency

The Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub.L. 94-163) for the State in which the work under the contract is performed.

20. Inspection and Acceptance of

(a) Definitions. As used in this clause -
(1) “Acceptance” means the act of an authorized representative of the PHA by which the PHA approves and assumes ownership of the work performed under this contract. Acceptance may be partial or complete.
(2) “Inspection” means examining and testing the work performed under the contract (including, when appropriate, raw materials, equipment, components, and intermediate assemblies) to determine whether it conforms to contract requirements.
(3) “Testing” means that element of inspection that determines the properties or elements, including functional operation of materials, equipment, or their components, by the application of established scientific principles and procedures.

(b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. All work is subject to PHA inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.

(c) PHA inspections and tests are for the sole benefit of the PHA and do not: (1) relieve the Contractor of responsibility for providing adequate quality control measures; (2) relieve the Contractor of responsibility for loss or damage of the material before acceptance; (3) constitute or imply acceptance; or, (4) affect the continuing rights of the PHA after acceptance of the completed work under paragraph (j) below.

(d) The presence or absence of the PHA inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specifications without the Contracting Officer’s written authorization. All instructions and approvals with respect to the work shall be given to the Contractor by the Contracting Officer.

(e) The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The PHA may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The PHA shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

(f) The PHA may conduct routine inspections of the construction site on a daily basis.

(g) The Contractor shall, without charge, replace or correct work found by the PHA not to conform to contract requirements, unless the PHA decides that it is in its interest to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(h) If the Contractor does not promptly replace or correct rejected work, the PHA may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor, or (2) terminate for default the Contractor's right to proceed.

(i) If any work requiring inspection is covered up without approval of the PHA, it must, if requested by the Contracting Officer, be uncovered at the expense of the Contractor. If at any time before final acceptance of the entire work, the **Construction** PHA considers it necessary or advisable, to examine work already completed by removing or tearing it out, the Contractor, shall on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray all the expenses of the examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, the Contracting Officer shall make an equitable adjustment to cover the cost of the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.

(j) The Contractor shall notify the Contracting Officer, in writing, as to the date when in its opinion all or a designated portion of the work will be substantially completed and ready for inspection. If the Architect determines that the state of preparedness is as represented, the PHA will promptly arrange for the inspection. Unless otherwise specified in the contract, the PHA shall accept, as soon as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines and designates can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the PHA's right under any warranty or guarantee.

21. Use and Possession Prior to Completion

(a) The PHA shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the PHA intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The PHA's possession or use shall not be deemed an acceptance of any work under the contract.

(b) While the PHA has such possession or use, the Contractor shall be relieved of the responsibility for (1) the loss of or damage to the work resulting from the PHA's possession or use, notwithstanding the terms of the clause entitled Permits and Codes herein; (2) all maintenance costs on the areas occupied; and, (3) furnishing heat, light, power, and water used in the areas occupied without proper remuneration therefore. If prior possession or use by the PHA delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

22. Warranty of Title

The Contractor warrants good title to all materials, supplies, and equipment incorporated in the work and agrees to deliver the premises together with all improvements thereon free from any claims, liens or charges, and agrees further that neither it nor any other person, firm or corporation shall have any right to a lien upon the premises or anything appurtenant thereto.

23. Warranty of

(a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (j) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or workmanship performed by the Contractor or any subcontractor or supplier at any tier. This warranty shall continue for a period of _____ (one year unless otherwise indicated) from the date of final acceptance of the work. If the PHA takes possession of any part of the work before final acceptance, this warranty shall continue for a period of (one year unless otherwise indicated) from the date that the PHA takes possession.

(b) The Contractor shall remedy, at the Contractor's expense, any failure to conform, or any defect. In addition, the Contractor shall remedy, at the Contractor's expense, any damage to PHA-owned or controlled real or personal property when the damage is the result of—

(1) The Contractor's failure to conform to contract requirements; or

(2) Any defects of equipment, material, workmanship or design furnished by the Contractor.

(c) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for (one year unless otherwise indicated) from the date of repair or replacement.

(d) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect or damage.

(e) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the PHA shall have the right to replace, repair or otherwise remedy the failure, defect, or damage at the Contractor's expense.

(f) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall:

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed in writing, for the benefit of the PHA; and,

(3) Enforce all warranties for the benefit of the PHA.

(g) In the event the Contractor's warranty under paragraph (a) of this clause has expired, the PHA may bring suit at its own expense to enforce a subcontractor's, manufacturer's or supplier's warranty.

(h) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defect of material or design furnished by the PHA nor for the repair of any damage that results from any defect in PHA furnished material or design.

(i) Notwithstanding any provisions herein to the contrary, the establishment of the time periods in paragraphs (a) and (c) above relate only to the specific obligation of the Contractor to correct the work, and have no relationship to the time within which its obligation to comply with the contract may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to its obligation other than specifically to correct the work.

(j) This warranty shall not limit the PHA's rights under the Inspection and Acceptance of Construction clause of this contract with respect to latent defects, gross mistakes or fraud.

24. Prohibition Against Liens

The Contractor is prohibited from placing a lien on the PHA's property. This prohibition shall apply to all subcontractors at any tier and all materials suppliers.

Administrative Requirements

25. Contract Period

this contract within calendar days of the effective date of the contract, or within the time schedule established in the notice to proceed issued by the Contracting Officer.

26. Order of Provisions

accordance with the terms and conditions of the

In the event of a conflict between these General Conditions and the Specifications, the General Conditions shall prevail. In the event of a conflict between the contract and any applicable state or local law or regulation, the state or local law or regulation shall prevail; provided that such state or local law or regulation does not conflict with, or is less restrictive than applicable federal law, regulation, or Executive Order. In the event of such a conflict, applicable federal law, regulation, and Executive Order shall prevail.

27. Payments

retain ten (10) percent of the amount of progress

(a) The PHA shall pay the Contractor the price as provided in this contract.

(b) The PHA shall make progress payments approximately every 30 days as the work proceeds, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer. The PHA may, subject to written determination and approval of the Contracting Officer, make more frequent payments to contractors which are qualified small businesses.

(c) Before the first progress payment under this contract, the Contractor shall furnish, in such detail as requested by the Contracting Officer, a breakdown of the total contract price showing the amount included therein for each principal category of the work, which shall substantiate the payment amount requested in order to provide a basis for determining progress payments. The breakdown shall be approved by the Contracting Officer and must be acceptable to HUD. If the contract covers more than one project, the Contractor shall furnish a separate breakdown for each. The values and quantities employed in making up this breakdown are for determining the amount of progress payments and shall not be construed as a basis for additions to or deductions from the contract price. The Contractor shall prorate its overhead and profit over the construction period of the contract.

(d) The Contractor shall submit, on forms provided by the PHA, periodic estimates showing the value of the work performed during each period based upon the approved

submitted not later than _____ days in advance of the date set for payment and are subject to correction and revision as required. The estimates must be approved by the Contracting Officer with the concurrence of the Architect prior to payment. If the contract covers more than one project, the Contractor shall furnish a separate progress payment estimate for each.

(e) Along with each request for progress payments and the required estimates, the Contractor shall furnish the following certification, or payment shall not be made: I hereby certify, to the best of my knowledge and belief, that:

(1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;

(2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements; and,

(3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in

subcontract.

Name:

Title:

Date:

(f) Except as otherwise provided in State law, the PHA shall

payments until completion and acceptance of all work under the contract; except, that if upon completion of 50 percent of the work, the Contracting Officer, after consulting with the Architect, determines that the Contractor's performance and progress are satisfactory, the PHA may make the remaining payments in full for the work subsequently completed. If the Contracting Officer subsequently determines that the Contractor's performance and progress are unsatisfactory, the PHA shall reinstate the ten (10) percent (or other percentage as provided in State law) retainage until such time as the Contracting Officer determines that performance and progress are satisfactory.

(g) The Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration when computing progress payments.

Material delivered to the Contractor at locations other than the site may also be taken into consideration if the Contractor furnishes satisfactory evidence that (1) it has acquired title to such material; (2) the material is properly stored in a bonded warehouse, storage yard, or similar suitable place as may be approved by the Contracting Officer; (3) the material is insured to cover its full value; and (4) the material will be used to perform this contract. Before any progress payment which includes delivered material is made, the Contractor shall furnish such documentation as the Contracting Officer may require to assure the protection of the PHA's interest in such materials. The Contractor shall remain responsible for such stored material notwithstanding the transfer of title to the PHA.

(h) All material and work covered by progress payments made shall, at the time of payment become the sole property of the PHA, but this shall not be construed as (1) relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or, (2) waiving the right of the PHA to require the fulfillment of all of the terms of the contract. In the event the work of the Contractor has been damaged by other contractors or persons other than employees of the PHA in the course of their employment, the Contractor shall restore such damaged work without cost to the PHA and to seek redress for its damage only from those who directly caused it.

(i) The PHA shall make the final payment due the Contractor under this contract after (1) completion and final acceptance of all work; and (2) presentation of release of all claims against the PHA arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. Each such exception shall embrace no more than one claim, the basis and scope of which shall be clearly defined. The amounts for such excepted claims shall not be included in the request for final payment. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned.

(j) Prior to making any payment, the Contracting Officer may require the Contractor to furnish receipts or other evidence of payment from all persons performing work and supplying material to the Contractor, if the Contracting Officer determines such evidence is necessary to substantiate claimed costs.

(k) The PHA shall not; (1) determine or adjust any claims for payment or disputes arising there under between the Contractor and its subcontractors or material suppliers; or, (2) withhold any moneys for the protection of the subcontractors or material suppliers. The failure or refusal of the PHA to withhold moneys from the Contractor shall in nowise impair the obligations of any surety or sureties under any bonds furnished under this contract.

28. Contract Modifications

(a) Only the Contracting Officer has authority to modify any term or condition of this contract. Any contract modification shall be authorized in writing.

(b) The Contracting Officer may modify the contract unilaterally (1) pursuant to a specific authorization stated in a contract clause (e.g., Changes); or (2) for administrative matters which do not change the rights or responsibilities of the parties (e.g., change in the PHA address). All other contract modifications shall be in the form of supplemental agreements signed by the Contractor and the Contracting Officer.

(c) When a proposed modification requires the approval of HUD prior to its issuance (e.g., a change order that exceeds the PHA's approved threshold), such modification shall not be effective until the required approval is received by the PHA.

29. Changes

(a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract including changes:
(1) In the specifications (including drawings and designs);
(2) In the method or manner of performance of the work;
(3) PHA-furnished facilities, equipment, materials, services, or site; or,
(4) Directing the acceleration in the performance of the work.

(b) Any other written order or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating (1) the date, circumstances and source of the order and (2) that the Contractor regards the order as a change order.

(c) Except as provided in this clause, no order, statement or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for a adjustment based on defective specifications, no proposal for any change under paragraph (b) above shall be allowed for any costs incurred more than 20 days (5 days for oral orders) before the Contractor gives written notice as required. In the case of defective specifications for which the PHA is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

(e) The Contractor must assert its right to an adjustment under this clause within 30 days after (1) receipt of a written change order under paragraph (a) of this clause, or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting a written statement describing the general nature and the amount of the proposal. If the facts justify it, the Contracting Officer may extend the period for submission. The proposal may be included in the notice required under paragraph (b) above. No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

(f) The Contractor's written proposal for equitable adjustment shall be submitted in the form of a lump sum proposal supported with an itemized breakdown of all increases and decreases in the contract in at least the following details:

(1) Direct Costs. Materials (list individual items, the quantity and unit cost of each, and the aggregate cost); Transportation and delivery costs associated with materials; Labor breakdowns by hours or unit costs (identified with specific work to be performed); Construction equipment exclusively necessary for the change; Costs of preparation and/ or revision to shop drawings resulting from the change; Worker's Compensation and Public Liability Insurance; Employment taxes under FICA and FUTA; and, Bond Costs when size of change warrants revision.

(2) Indirect Costs. Indirect costs may include overhead, general and administrative expenses, and fringe benefits not normally treated as direct costs.

(3) Profit. The amount of profit shall be negotiated and may vary according to the nature, extent, and complexity of the work required by the change. The allowability of the direct and indirect costs shall be determined in accordance with the Contract Cost Principles and Procedures for Commercial Firms in Part 31 of the Federal Acquisition Regulation (48 CFR 1-31), as implemented by HUD Handbook 2210.18, in effect on the date of this contract. The Contractor shall not be allowed a profit on the profit received by any subcontractor. Equitable adjustments for deleted work shall include a credit for profit and may include a credit for indirect costs. On proposals covering both increases and decreases in the amount of the contract, the application of indirect costs and profit shall be on the net-change in direct costs for the Contractor or subcontractor performing the work.

(g) The Contractor shall include in the proposal its request for time extension (if any), and shall include sufficient information and dates to demonstrate whether and to what extent the change will delay the completion of the contract in its entirety.

(h) The Contracting Officer shall act on proposals within 30 days after their receipt, or notify the Contractor of the date when such action will be taken.

(i) Failure to reach an agreement on any proposal shall be a dispute under the clause entitled Disputes herein. Nothing in this clause, however, shall excuse the Contractor from proceeding with the contract as changed.

(j) Except in an emergency endangering life or property, no change shall be made by the Contractor without a prior order from the Contracting Officer.

30. Suspension of Work

(a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the PHA.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified (or within a reasonable time if not specified) in this contract an adjustment shall be made for any increase in the cost of performance of the contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or for which any equitable adjustment is provided for or excluded under any other provision of this contract.

(c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order); and, (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

31. Disputes

(a) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to the contract. A claim arising under the contract, unlike a claim relating to the contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim. The submission may be converted to a claim by complying with the requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.

(b) Except for disputes arising under the clauses entitled Labor Standards - Davis Bacon and Related Acts, herein, all disputes arising under or relating to this contract, including any claims for damages for the alleged breach thereof which are not disposed of by agreement, shall be resolved under this clause.

(c) All claims by the Contractor shall be made in writing and submitted to the Contracting Officer for a written decision. A claim by the PHA against the Contractor shall be subject to a written decision by the Contracting Officer.

(d) The Contracting Officer shall, within 60 (unless otherwise indicated) days after receipt of the request, decide the claim or notify the Contractor of the date by which the decision will be made.

(e) The Contracting Officer's decision shall be final unless the Contractor (1) appeals in writing to a higher level in the PHA in accordance with the PHA's policy and procedures, (2) refers the appeal to an independent mediator or arbitrator, or (3) files suit in a court of competent jurisdiction. Such appeal must be made within (30 unless otherwise indicated) days after receipt of the Contracting Officer's decision.

(f) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of the Contracting Officer.

32. Default

(a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with the diligence that will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within this time, the Contracting Officer may, by written notice to the Contractor, terminate the right to

proceed with the work (or separable part of the work) that has been delayed. In this event, the PHA may take over the work and complete it, by contract or otherwise, and may take possession of and use any materials, equipment, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the PHA resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the PHA in completing the work.

(b) The Contractor's right to proceed shall not be terminated or the Contractor charged with damages under this clause if—

(1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include (i) acts of God, or of the public enemy, (ii) acts of the PHA or other governmental entity in either its sovereign or contractual capacity, (iii) acts of another contractor in the performance of a contract with the PHA, (iv) fires, (v) floods, (vi) epidemics, (vii) quarantine restrictions, (viii) strikes, (ix) freight embargoes, (x) unusually severe weather, or (xi) delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and

(2) The Contractor, within days (10 days unless otherwise indicated) from the beginning of such delay (unless extended by the Contracting Officer) notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of the delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, time for completing the work shall be extended by written modification to the contract. The findings of the Contracting Officer shall be reduced to a written decision which shall be subject to the provisions of the Disputes clause of this contract.

(c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been for convenience of the PHA.

33. Liquidated Damages

(a) If the Contractor fails to complete the work within the time specified in the contract, or any extension, as specified in the clause entitled Default of this contract, the Contractor shall pay to the PHA as liquidated damages, the sum of $ 0.00 [Contracting Officer insert amount] for each day of delay. If different completion dates are specified in the contract for separate parts or stages of the work, the amount of liquidated damages shall be assessed on those parts or stages which are delayed. To the extent that the Contractor's delay or nonperformance is excused under another clause in this contract, liquidated damages shall not be due the PHA. The Contractor remains liable for damages caused other than by delay.

(b) If the PHA terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the PHA in completing the work.

(c) If the PHA does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

34. Termination for Convenience

(a) The Contracting Officer may terminate this contract in whole, or in part, whenever the Contracting Officer determines that such termination is in the best interest of the PHA. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which the performance of the work under the contract is terminated, and the date upon which such termination becomes effective.

(b) If the performance of the work is terminated, either in whole or in part, the PHA shall be liable to the Contractor for reasonable and proper costs resulting from such termination upon the receipt by the PHA of a properly presented claim setting out in detail: (1) the total cost of the work performed to date of termination less the total amount of contract payments made to the Contractor; (2) the cost (including reasonable profit) of settling and paying claims under subcontracts and material orders for work performed and materials and supplies delivered to the site, payment for which has not been made by the PHA to the Contractor or by the Contractor to the subcontractor or supplier; (3) the cost of preserving and protecting the work already performed until the PHA or assignee takes possession thereof or assumes responsibility therefore; (4) the actual or estimated cost of legal and accounting services reasonably necessary to prepare and present the termination claim to the PHA; and (5) an amount constituting a reasonable profit on the value of the work performed by the Contractor.

(c) The Contracting Officer will act on the Contractor's claim within days (60 days unless otherwise indicated) of receipt of the Contractor's claim.

(d) Any disputes with regard to this clause are expressly made subject to the provisions of the Disputes clause of this contract.

35. Assignment of Contract

The Contractor shall not assign or transfer any interest in this contract; except that claims for monies due or to become due from the PHA under the contract may be assigned to a bank, trust company, or other financial institution. Such assignments of claims shall only be made with the written concurrence of the Contracting Officer. If the Contractor is a partnership, this contract shall inure to the benefit of the surviving or remaining member(s) of such partnership as approved by the Contracting Officer.

36. Insurance

(a) Before commencing work, the Contractor and each subcontractor shall furnish the PHA with certificates of insurance showing the following insurance is in force and will insure all operations under the Contract:

(1) Workers' Compensation, in accordance with state or Territorial Workers' Compensation laws.

(2) Commercial General Liability with a combined single limit for bodily injury and property damage of not less than $500,000. [Contracting Officer insert amount]

per occurrence to protect the Contractor and each subcontractor against claims for bodily injury or death and damage to the property of others. This shall cover the use of all equipment, hoists, and vehicles on the site(s) not covered by Automobile Liability under (3) below. If the Contractor has a "claims made" policy, then the following additional requirements apply: the policy must provide a "retroactive date" which must be on or before the execution date of the Contract; and the extended reporting period may not be less than five years following the completion date of the Contract.

(3) Automobile Liability on owned and non -owned motor vehicles used on the site(s) or in connection therewith for a combined single limit for bodily injury and property damage of not less than $ 500,000. [Contracting Officer insert amount] per occurrence.

(b) Before commencing work, the Contractor shall furnish the PHA with a certificate of insurance evidencing that Builder's Risk (fire and extended coverage) Insurance on all work in place and/or materials stored at the building site(s), including foundations and building equipment, is in force. The Builder's Risk Insurance shall be for the benefit of the Contractor and the PHA as their interests may appear and each shall be named in the policy or policies as an insured. The Contractor in installing equipment supplied by the PHA shall carry insurance on such equipment from the time the Contractor takes possession thereof until the Contract work is accepted by the PHA. The Builder's Risk Insurance need not be carried on excavations, piers, footings, or foundations until such time as work on the superstructure is started. It need not be carried on landscape work. Policies shall furnish coverage at all times for the full cash value of all completed construction, as well as materials in place and/or stored at the site(s), whether or not partial payment has been made by the PHA. The Contractor may terminate this insurance on buildings as of the date taken over for occupancy by the PHA. The Contractor is not required to carry Builder's Risk Insurance for modernization work which does not involve structural alterations or additions and where the PHA's existing fire and extended coverage policy can be endorsed to include such work.

(c) All insurance shall be carried with companies which are financially responsible and admitted to do business in the State in which the project is located. If any such insurance is due to expire during the construction period, the Contractor (including subcontractors, as applicable) shall not permit the coverage to lapse and shall furnish evidence of coverage to the Contracting Officer. All certificates of insurance, as evidence of coverage, shall provide that no coverage may be canceled or non-renewed by the insurance company until at least 30 days prior written notice has been given to the Contracting Officer.

37. Subcontracts

(a) Definitions. As used in this contract -

(1) "Subcontract" means any contract, purchase order, or other purchase agreement, including modifications and change orders to the foregoing, entered into by a subcontractor to furnish supplies, materials, equipment, and services for the performance of the prime contract or a subcontract.

(2) "Subcontractor" means any supplier, vendor, or firm that furnishes supplies, materials, equipment, or services to or for the Contractor or another subcontractor.

(b) The Contractor shall not enter into any subcontract with any subcontractor who has been temporarily denied participation in a HUD program or who has been suspended or debarred from participating in contracting programs by any agency of the United States Government or of the state in which the work under this contract is to be performed.

(c) The Contractor shall be as fully responsible for the acts or omissions of its subcontractors, and of persons either directly or indirectly employed by them as for the acts or omissions of persons directly employed by the Contractor.

(d) The Contractor shall insert appropriate clauses in all subcontracts to bind subcontractors to the terms and conditions of this contract insofar as they are applicable to the work of subcontractors.

(e) Nothing contained in this contract shall create any contractual relationship between any subcontractor and the PHA or between the subcontractor and HUD.

38. Subcontracting with Small and Minority Firms, Women's Business Enterprise, and Labor Surplus Area Firms

The Contractor shall take the following steps to ensure that, whenever possible, subcontracts are awarded to small business firms, minority firms, women's business enterprises, and labor surplus area firms:

(a) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

(b) Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;

(c) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;

(d) Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises; and

(e) Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies.

39. Equal Employment Opportunity

During the performance of this contract, the Contractor/ Seller agrees as follows:

(a) The Contractor/Seller shall not discriminate against any employee or applicant for employment because of of race color, religion, sex, sexual orientation, gender identity, disability, or national origin.

(b) The Contractor/Seller shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, disability, or national origin. Such action shall include, but not be limited to, (1) employment, (2) upgrading demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training,including apprenticeship

(c) The Contractor/Seller agrees to post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.
(d) The Contractor/Seller shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor/Seller, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
(e) The Contractor/Seller shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.
(f) The Contractor/Seller shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.
(g) The Contractor/Seller shall furnish all information and reports required by Executive Order 11246, as amended, Section 503 of the Rehabilitation Act of 1973, as amended, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto. The Contractor/Seller shall permit

access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(h) In the event of a that the Contractor/Seller is in noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and the contractor/seller may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(i)The contractor/seller will include the provisions of paragraphs (a) through (h) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each sub[contractor/seller] or vendor. The [contractor/seller] will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions in cluding sanctions for noncompliance: Provided, however, that in the event the [contractor/seller] becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the [contractor/seller] may request the United States to enter into such litigation to protect the interests of the United States.

(j) Compliance with the requirements of this clause shall be to the maximum extent consistent with, but not in derogation of, compliance with section 7(b) of the Indian Self-Determination and Education Assistance Act and the Indian Preference clause of this contract.

40. Employment, Training, and Contracting Opportunities for Low-Income Persons, Section 3 of the Housing and Urban Development Act of 1968.

(a) The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.
(b) The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 75, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the Part 75 regulations.
(c) The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this section 3 clause and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 prioritization requirements and shall state the minimum percentages of labor hour requirements established in the Benchmark Notice (FR-6085-N-04).
(d) The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 75, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 75. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 75.
(e) Noncompliance with HUD's regulations in 24 CFR Part 75 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.
(f) Contracts, subcontracts, grants, or subgrants subject to Section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 5307(b)) or subject to tribal preference requirements as authorized under 101(k) of the Native American Housing Assistance and Self-Determination Act (25 U.S.C. 4111(k)) must provide preferences in employment, training, and business opportunities to Indians and Indian organizations, and are therefore not subject to the requirements of 24 CFR Part 75.

41. Interest of Members of Congress

No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of this contract or to any benefit that may arise therefrom.

42. Interest of Members, Officers, or Employees and Former Members, Officers, or Employees

No member, officer, or employee of the PHA, no member of the governing body of the locality in which the project is situated, no member of the governing body of the locality in which the PHA was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the project, shall, during his or her tenure, or for one year thereafter, have any interest, direct or indirect, in this contract or the proceeds thereof.

43. Limitations on Payments made to Influence Certain Federal Financial Transactions

(a) The Contractor agrees to comply with Section 1352 of Title 31, United States Code which prohibits the use of Acts Federal appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

(b) The Contractor further agrees to comply with the requirement of the Act to furnish a disclosure (OMB Standard Form LLL, Disclosure of Lobbying Activities) if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

44. Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringement of any patent rights and shall save the PHA harmless from loss on account thereof; except that the PHA shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified and the Contractor has no reason to believe that the specified design, process, or product is an infringement. If, however, the Contractor has reason to believe that any design, process or product specified is an infringement of a patent, the Contractor shall promptly notify the Contracting Officer. Failure to give such notice shall make the Contractor responsible for resultant loss.

45. Examination and Retention of Contractor's Records

(a) The PHA, HUD, or Comptroller General of the United States, or any of their duly authorized representatives shall, until 3 years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.

(b) The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders not exceeding $10,000.

(c) The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the Disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the PHA, HUD, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

46. Labor Standards - Davis-Bacon and Related

If the total amount of this contract exceeds $2,000, the Federal labor standards set forth in the clause below shall apply to the development or construction work to be performed under the contract.

(a) Minimum Wages.

(1) All laborers and mechanics employed under this contract in the development or construction of the project(s) involved will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the regular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall

be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(2) (i) Any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met: (A) The work to be performed by the classification requested is not performed by a classification in the wage determination; and (B) The classification is utilized in the area by the construction industry; and (C) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employee Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.

(iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.

(iv) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (a)(2)(ii) or (iii) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in classification.

(3) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(4) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(b) Withholding of funds. HUD or its designee shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working in the construction or development of the project, all or part of the wages required by the contract, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due.

(c) Payrolls and basic records.

(1) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working in the construction or development of the project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(2) (i) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under subparagraph (c)(1) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The Contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1214-0149.)

(ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(A) That the payroll for the payroll period contains the information required to be maintained under paragraph (c) (1) of this clause and that such information is correct and complete;

(B) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3; and

(C) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirements for submission of the "Statement of Compliance" required by subparagraph (c)(2)(ii) of this clause.

(iv) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(3) The Contractor or subcontractor shall make the records required under subparagraph (c)(1) available for inspection, copying, or transcription by authorized representatives of HUD or its designee, the Contracting Officer, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(d) (1) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship and Training, Employer and Labor Services (OATELS), or with a State Apprenticeship Agency recognized by OATELS, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by OATELS or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event OATELS, or a State Apprenticeship Agency recognized by OATELS, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under

the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(3) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

(e) Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.

(f) Contract termination; debarment. A breach of this contract clause may be grounds for termination of the contract and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.

(g) Compliance with Davis-Bacon and related Act requirements. All rulings and interpretations of the Davis-Bacon and related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

(h) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this clause shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the PHA, HUD, the U.S. Department of Labor, or the employees or their representatives.

(i) Certification of eligibility.

(1) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(2) No part of this contract shall be subcontracted to any person or firm ineligible for award of a United States Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(3) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

(j) Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics, including watchmen and guards, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions set forth in subparagraph (j)(1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic (including watchmen and guards) employed in violation of the provisions set forth in subparagraph (j)(1) of this clause, in the sum of $27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in subparagraph (j)(1) of this clause. DOL posts current fines at: https://www.dol.gov/whd/govcontracts/cwhssa.htm#cmp

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in subparagraph (j)(2) of this clause.

(k) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts all the provisions contained in this clause, and such other clauses as HUD or its designee may by appropriate instructions require, and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all these provisions.

47. Non-Federal Prevailing Wage Rates

(a) Any prevailing wage rate (including basic hourly rate and any fringe benefits), determined under State or tribal law to be prevailing, with respect to any employee in any trade or position employed under the contract, is inapplicable to the contract and shall not be enforced against the Contractor or any subcontractor, with respect to employees engaged under the contract whenever such non-Federal prevailing wage rate exceeds:

(1) The applicable wage rate determined by the Secretary of Labor pursuant to the Davis-Bacon Act (40 U.S.C. 3141 et seq.) to be prevailing in the locality with respect to such trade;

(b) An applicable apprentice wage rate based thereon specified in an apprenticeship program registered with the U.S. Department of Labor (DOL) or a DOL-recognized State Apprenticeship Agency; or

(c) An applicable trainee wage rate based thereon specified in a DOL-certified trainee program.

48. Procurement of Recovered Materials.

(a) In accordance with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, the Contractor shall procure items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition. The Contractor shall procure items designated in the EPA guidelines that contain the highest percentage of recovered materials practicable unless the Contractor determines that such items: (1) are not reasonably available in a reasonable period of time; (2) fail to meet reasonable performance standards, which shall be determined on the basis of the guidelines of the National Institute of Standards and Technology, if applicable to the item; or (3) are only available at an unreasonable price.

( ) Paragraph (a) of this clause shall apply to items purchased under this contract where: (1) the Contractor purchases in excess of $10,000 of the item under this contract; or (2) during the preceding Federal fiscal year, the Contractor: (i) purchased any amount of the items for use under a contract that was funded with Federal appropriations and was with a Federal agency or a State agency or agency of a political subdivision of a State; and (ii) purchased a total of in excess of $10,000 of the item both under and outside that contract.

U.S. Department of Housing and Urban Development

Office of Public and Indian Housing

Instructions to Bidders for Contracts Public and Indian Housing Programs

Instructions to Bidders for Contracts

Public and Indian Housing Programs

Table of Contents

1. Bid Preparation and Submission

(a) Bidders are expected to examine the specifications, drawings, all instructions, and, if applicable, the construction site (see also the contract clause entitled **Site Investigation and Conditions Affecting the Work** of the *General Conditions of the Contract for Construction*). Failure to do so will be at the bidders' risk.

(b) All bids must be submitted on the forms provided by the Public Housing Agency/Indian Housing Authority (PHA/IHA). Bidders shall furnish all the information required by the solicitation. Bids must be signed and the bidder's name typed or printed on the bid sheet and each continuation sheet which requires the entry of information by the bidder. Erasures or other changes must be initialed by the person signing the bid. Bids signed by an agent shall be accompanied by evidence of that agent's authority. (Bidders should retain a copy of their bid for their records.)

(c) Bidders must submit as part of their bid a completed form HUD-5369-A, "Representations, Certifications, and Other Statements of Bidders."

(d) All bid documents shall be sealed in an envelope which shall be clearly marked with the words "Bid Documents," the Invitation for Bids (IFB) number, any project or other identifying number, the bidder's name, and the date and time for receipt of bids.

(e) If this solicitation requires bidding on all items, failure to do so will disqualify the bid. If bidding on all items is not required, bidders should insert the words "No Bid" in the space provided for any item on which no price is submitted.

(f) Unless expressly authorized elsewhere in this solicitation, alternate bids will not be considered.

(g) Unless expressly authorized elsewhere in this solicitation, bids submitted by telegraph or facsimile (fax) machines will not be considered.

(h) If the proposed contract is for a Mutual Help project (as described in 24 CFR Part 905, Subpart E) that involves Mutual Help contributions of work, material, or equipment, supplemental information regarding the bid advertisement is provided as an attachment to this solicitation.

2. Explanations and Interpretations to Prospective Bidders

(a) Any prospective bidder desiring an explanation or interpretation of the solicitation, specifications, drawings, etc., must request it at least 7 days before the scheduled time for bid opening. Requests may be oral or written. Oral requests must be confirmed in writing. The only oral clarifications that will be provided will be those clearly related to solicitation procedures, i.e., not substantive technical information. No other oral explanation or interpretation will be provided. Any information given a prospective bidder concerning this solicitation will be furnished promptly to all other prospective bidders as a written amendment to the solicitation, if that information is necessary in submitting bids, or if the lack of it would be prejudicial to other prospective bidders.

(b) Any information obtained by, or provided to, a bidder other than by formal amendment to the solicitation shall not constitute a change to the solicitation.

3. Amendments to Invitations for Bids

(a) If this solicitation is amended, then all terms and conditions which are not modified remain unchanged.

(b) Bidders shall acknowledge receipt of any amendment to this solicitation (1) by signing and returning the amendment, (2) by identifying the amendment number and date on the bid form, or (3) by letter, telegram, or facsimile, if those methods are authorized in the solicitation. The PHA/IHA must receive acknowledgement by the time and at the place specified for receipt of bids. Bids which fail to acknowledge the bidder's receipt of any amendment will result in the rejection of the bid if the amendment(s) contained information which substantively changed the PHA's/IHA's requirements.

(c) Amendments will be on file in the offices of the PHA/IHA and the Architect at least 7 days before bid opening.

4. Responsibility of Prospective Contractor

(a) The PHA/IHA will award contracts only to responsible prospective contractors who have the ability to perform successfully under the terms and conditions of the proposed contract. In determining the responsibility of a bidder, the PHA/IHA will consider such matters as the bidder's:

(1) Integrity;

(2) Compliance with public policy;

(3) Record of past performance; and

(4) Financial and technical resources (including construction and technical equipment).

(b) Before a bid is considered for award, the bidder may be requested by the PHA/IHA to submit a statement or other documentation regarding any of the items in paragraph (a) above. Failure by the bidder to provide such additional information shall render the bidder nonresponsible and ineligible for award.

5. Late Submissions, Modifications, and Withdrawal of Bids

(a) Any bid received at the place designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before award is made and it:

(1) Was sent by registered or certified mail not later than the fifth calendar day before the date specified for receipt of offers (e.g., an offer submitted in response to a solicitation requiring receipt of offers by the 20th of the month must have been mailed by the 15th);

(2) Was sent by mail, or if authorized by the solicitation, was sent by telegram or via facsimile, and it is determined by the PHA/IHA that the late receipt was due solely to mishandling by the PHA/IHA after receipt at the PHA/IHA; or

(3) Was sent by U.S. Postal Service Express Mail Next Day Service - Post Office to Addressee, not later than 5:00 p.m. at the place of mailing two working days prior to the date specified for receipt of proposals. The term "working days" excludes weekends and observed holidays.

(b) Any modification or withdrawal of a bid is subject to the same conditions as in paragraph (a) of this provision.

(c) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent either by registered or certified mail is the U.S. or Canadian Postal Service postmark both on the envelope or wrapper and on the original receipt from the U.S. or Canadian Postal Service. Both postmarks must show a legible date or the bid, modification, or withdrawal shall be processed as if mailed late. "Postmark" means a printed, stamped, or otherwise placed impression (exclusive of a postage meter machine impression) that is readily identifiable without further action as having been supplied and affixed by employees of the U.S. or Canadian Postal Service on the date of mailing. Therefore, bidders should request the postal clerk to place a hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

(d) The only acceptable evidence to establish the time of receipt at the PHA/IHA is the time/date stamp of PHA/IHA on the proposal wrapper or other documentary evidence of receipt maintained by the PHA/IHA.

(e) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent by Express Mail Next Day Service-Post Office to Addressee is the date entered by the post office receiving clerk on the "Express Mail Next Day Service-Post Office to Addressee" label and the postmark on both the envelope or wrapper and on the original receipt from the U.S. Postal Service. "Postmark" has the same meaning as defined in paragraph (c) of this provision, excluding postmarks of the Canadian Postal Service. Therefore, bidders should request the postal clerk to place a legible hand cancellation bull's eye postmark on both the receipt and Failure by a bidder to acknowledge receipt of the envelope or wrapper.

(f) Notwithstanding paragraph (a) of this provision, a late modification of an otherwise successful bid that makes its terms more favorable to the PHA/IHA will be considered at any time it is received and may be accepted.

(g) Bids may be withdrawn by written notice, or if authorized by this solicitation, by telegram (including mailgram) or facsimile machine transmission received at any time before the exact time set for opening of bids; provided that written confirmation of telegraphic or facsimile withdrawals over the signature of the bidder is mailed and postmarked prior to the specified bid opening time. A bid may be withdrawn in person by a bidder or its authorized representative if, before the exact time set for opening of bids, the identity of the person requesting withdrawal is established and the person signs a receipt for the bid.

6. Bid Opening

All bids received by the date and time of receipt specified in the solicitation will be publicly opened and read. The time and place of opening will be as specified in the solicitation. Bidders and other interested persons may be present.

7. Service of Protest

(a) Definitions. As used in this provision:

"Interested party" means an actual or prospective bidder whose direct economic interest would be affected by the award of the contract.

"Protest" means a written objection by an interested party to this solicitation or to a proposed or actual award of a contract pursuant to this solicitation.

(b) Protests shall be served on the Contracting Officer by obtaining written and dated acknowledgement from —

[Contracting Officer designate the official or location where a protest may be served on the Contracting Officer]

(c) All protests shall be resolved in accordance with the PHA's/IHA's protest policy and procedures, copies of which are maintained at the PHA/IHA.

8. Contract Award

(a) The PHA/IHA will evaluate bids in response to this solicitation without discussions and will award a contract to the responsible bidder whose bid, conforming to the solicitation, will be most advantageous to the PHA/IHA considering only price and any price-related factors specified in the solicitation.

(b) If the apparent low bid received in response to this solicitation exceeds the PHA's/IHA's available funding for the proposed contract work, the PHA/IHA may either accept separately priced items (see 8(e) below) or use the following procedure to determine contract award. The PHA/IHA shall apply in turn to each bid (proceeding in order from the apparent low bid to the high bid) each of the separately priced bid deductible items, if any, in their priority order set forth in this solicitation. If upon the application of the first deductible item to all initial bids, a new low bid is within the PHA's/IHA's available funding, then award shall be made to that bidder. If no bid is within the available funding amount, then the PHA/IHA shall apply the second deductible item. The PHA/IHA shall continue this process until an evaluated low bid, if any, is within the PHA's/IHA's available funding. If upon the application of all deductibles, no bid is within the PHA's/IHA's available funding, or if the solicitation does not request separately priced deductibles, the PHA/IHA shall follow its written policy and procedures in making any award under this solicitation.

(c) In the case of tie low bids, award shall be made in accordance with the PHA's/IHA's written policy and procedures.

(d) The PHA/IHA may reject any and all bids, accept other than the lowest bid (e.g., the apparent low bid is unreasonably low), and waive informalities or minor irregularities in bids received, in accordance with the PHA's/IHA's written policy and procedures.

(e) Unless precluded elsewhere in the solicitation, the PHA/IHA may accept any item or combination of items bid.

(f) The PHA/IHA may reject any bid as nonresponsive if it is materially unbalanced as to the prices for the various items of work to be performed. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated for other work.

(g) A written award shall be furnished to the successful bidder within the period for acceptance specified in the bid and shall result in a binding contract without further action by either party.

9. Bid Guarantee (applicable to construction and equipment contracts exceeding $25,000)

All bids must be accompanied by a negotiable bid guarantee which shall not be less than five percent (5%) of the amount of the bid. The bid guarantee may be a certified check, bank draft, U.S. Government Bonds at par value, or a bid bond secured by a surety company acceptable to the U.S. Government and authorized to do business in the state where the work is to be performed. In the case where the work under the contract will be performed on an Indian reservation area, the bid guarantee may also be an irrevocable Letter of Credit (see provision 10, Assurance of Completion, below). Certified checks and bank drafts must be made payable to the order of the PHA/IHA. The bid guarantee shall insure the execution of the contract and the furnishing of a method of assurance of completion by the successful bidder as required by the solicitation. Failure to submit a bid guarantee with the bid shall result in the rejection of the bid. Bid guarantees submitted by unsuccessful bidders will be returned as soon as practicable after bid opening.

10. Assurance of Completion

(a) Unless otherwise provided in State law, the successful bidder shall furnish an assurance of completion prior to the execution of any contract under this solicitation. This assurance may be [Contracting Officer check applicable items] —

[ ] (1) a performance and payment bond in a penal sum of 100 percent of the contract price; or, as may be required or permitted by State law;

[ ] (2) separate performance and payment bonds, each for 50 percent or more of the contract price;

[ ] (3) a 20 percent cash escrow;

[ ] (4) a 25 percent irrevocable letter of credit; or,

[ ] (5) an irrevocable letter of credit for 10 percent of the total contract price with a monitoring and disbursements agreement with the IHA (applicable only to contracts awarded by an IHA under the Indian Housing Program).

(b) Bonds must be obtained from guarantee or surety companies acceptable to the U.S. Government and authorized to do business in the state where the work is to be performed. Individual sureties will not be considered. U.S. Treasury Circular Number 570, published annually in the Federal Register, lists companies approved to act as sureties on bonds securing Government contracts, the maximum underwriting limits on each contract bonded, and the States in which the company is licensed to do business. Use of companies listed in this circular is mandatory. Copies of the circular may be downloaded on the U.S. Department of Treasury website **http://www.fms.treas.gov/c570/index.html**, or ordered for a minimum fee by contacting the Government Printing Office at (202) 512-2168.

(c) Each bond shall clearly state the rate of premium and the total amount of premium charged. The current power of attorney for the person who signs for the surety company must be attached to the bond. The effective date of the power of attorney shall not precede the date of the bond. The effective date of the bond shall be on or after the execution date of the contract.

(d) Failure by the successful bidder to obtain the required assurance of completion within the time specified, or within such extended period as the PHA/IHA may grant based upon reasons determined adequate by the PHA/IHA, shall render the bidder ineligible for award. The PHA/IHA may then either award the contract to the next lowest responsible bidder or solicit new bids. The PHA/IHA may retain the ineligible bidder's bid guarantee.

11. Preconstruction Conference (applicable to construction contracts)

After award of a contract under this solicitation and prior to the start of work, the successful bidder will be required to attend a preconstruction conference with representatives of the PHA/IHA and its architect/engineer, and other interested parties convened by the PHA/IHA. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract (e.g., Equal Employment Opportunity, Labor Standards). The PHA/IHA will provide the successful bidder with the date, time, and place of the conference.

12. Indian Preference Requirements (applicable only if this solicitation is for a contract to be performed on a project for an Indian Housing Authority)

(a) HUD has determined that the contract awarded under this solicitation is subject to the requirements of section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e(b)). Section 7(b) requires that any contract or subcontract entered into for the benefit of Indians shall require that, to the greatest extent feasible

(1) Preferences and opportunities for training and employment (other than core crew positions; see paragraph (h) below) in connection with the administration of such contracts or subcontracts be given to qualified "Indians." The Act defines "Indians" to mean persons who are members of an Indian tribe and defines "Indian tribe" to mean any Indian tribe, band, nation, or other organized group or community, including any Alaska Native village or regional or village corporation as defined in or established pursuant to the Alaska Native Claims Settlement Act, which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians; and,

(2) Preference in the award of contracts or subcontracts in connection with the administration of contracts be given to Indian organizations and to Indian-owned economic enterprises, as defined in section 3 of the Indian Financing Act of 1974 (25 U.S.C. 1452). That Act defines "economic enterprise" to mean any Indian-owned commercial, industrial, or business activity established or organized for the purpose of profit, except that the Indian ownership must constitute not less than 51 percent of the enterprise; "Indian organization" to mean the governing body of any Indian tribe or entity established or recognized by such governing body; "Indian" to mean any person who is a member of any tribe, band, group, pueblo, or community which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs and any "Native" as defined in the Alaska Native Claims Settlement Act; and Indian "tribe" to mean any Indian tribe, band, group, pueblo, or community including Native villages and Native groups (including

corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs.

(b) (1) The successful Contractor under this solicitation shall comply with the requirements of this provision in awarding all subcontracts under the contract and in providing training and employment opportunities.

(2) A finding by the IHA that the contractor, either (i) awarded a subcontract without using the procedure required by the IHA, (ii) falsely represented that subcontracts would be awarded to Indian enterprises or organizations; or, (iii) failed to comply with the contractor's employment and training preference bid statement shall be grounds for termination of the contract or for the assessment of penalties or other remedies.

(c) If specified elsewhere in this solicitation, the IHA may restrict the solicitation to qualified Indian-owned enterprises and Indian organizations. If two or more (or a greater number as specified elsewhere in the solicitation) qualified Indian-owned enterprises or organizations submit responsive bids, award shall be made to the qualified enterprise or organization with the lowest responsive bid. If fewer than the minimum required number of qualified Indian-owned enterprises or organizations submit responsive bids, the IHA shall reject all bids and readvertise the solicitation in accordance with paragraph (d) below.

(d) If the IHA prefers not to restrict the solicitation as described in paragraph (c) above, or if after having restricted a solicitation an insufficient number of qualified Indian enterprises or organizations submit bids, the IHA may advertise for bids from non-Indian as well as Indian-owned enterprises and Indian organizations. Award shall be made to the qualified Indian enterprise or organization with the lowest responsive bid if that bid is -

(1) Within the maximum HUD-approved budget amount established for the specific project or activity for which bids are being solicited; and

(2) No more than the percentage specified in 24 CFR 905.175(c) higher than the total bid price of the lowest responsive bid from any qualified bidder. If no responsive bid by a qualified Indian-owned economic enterprise or organization is within the stated range of the total bid price of the lowest responsive bid from any qualified enterprise, award shall be made to the bidder with the lowest bid.

(e) Bidders seeking to qualify for preference in contracting or subcontracting shall submit proof of Indian ownership with their bids. Proof of Indian ownership shall include but not be limited to:

(1) Certification by a tribe or other evidence that the bidder is an Indian. The IHA shall accept the certification of a tribe that an individual is a member.

(2) Evidence such as stock ownership, structure, management, control, financing and salary or profit sharing arrangements of the enterprise.

(f) (1) All bidders must submit with their bids a statement describing how they will provide Indian preference in the award of subcontracts. The specific requirements of that statement and the factors to used by the IHA in determining the statement's adequacy are included as an attachment to this solicitation. Any bid that fails to include the required statement shall be rejected as nonresponsive. The IHA may require that comparable statements be provided by subcontractors to the successful Contractor, and may require the Contractor to reject any bid or proposal by a subcontractor that fails to include the statement.

(2) Bidders and prospective subcontractors shall submit a certification (supported by credible evidence) to the IHA in any instance where the bidder or subcontractor believes it is infeasible to provide Indian preference in subcontracting. The acceptance or rejection by the IHA of the certification shall be final. Rejection shall disqualify the bid from further consideration.

(g) All bidders must submit with their bids a statement detailing their employment and training opportunities and their plans to provide preference to Indians in implementing the contract; and the number or percentage of Indians anticipated to be employed and trained. Comparable statements from all proposed subcontractors must be submitted. The criteria to be used by the IHA in determining the statement(s)'s adequacy are included as an attachment to this solicitation. Any bid that fails to include the required statement(s), or that includes a statement that does not meet minimum standards required by the IHA shall be rejected as nonresponsive.

(h) Core crew employees. A core crew employee is an individual who is a bona fide employee of the contractor at the time the bid is submitted; or an individual who was not employed by the bidder at the time the bid was submitted, but who is regularly employed by the bidder in a supervisory or other key skilled position when work is available. Bidders shall submit with their bids a list of all core crew employees.

(i) Preference in contracting, subcontracting, employment, and training shall apply not only on-site, on the reservation, or within the IHA's jurisdiction, but also to contracts with firms that operate outside these areas (e.g., employment in modular or manufactured housing construction facilities).

(j) Bidders should contact the IHA to determine if any additional local preference requirements are applicable to this solicitation.

(k) The IHA [ ] does [ ] does not [Contracting Officer check applicable box] maintain lists of Indian-owned economic enterprises and Indian organizations by specialty (e.g., plumbing, electrical, foundations), which are available to bidders to assist them in meeting their responsibility to provide preference in connection with the administration of contracts and subcontracts.

U.S. Department of Housing and Urban Development

Office of Public and Indian Housing

Representations, Certifications, and Other Statements of Bidders

Public and Indian Housing Programs

Representations, Certifications, and Other Statements of Bidders

Public and Indian Housing Programs

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1. Certificate of Independent Price Determination

(a) The bidder certifies that--

(1) The prices in this bid have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other bidder or competitor relating to (i) those prices, (ii) the intention to submit a bid, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this bid have not been and will not be knowingly disclosed by the bidder, directly or indirectly, to any other bidder or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a competitive proposal solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the bidder to induce any other concern to submit or not to submit a bid for the purpose of restricting competition.

(b) Each signature on the bid is considered to be a certification by the signatory that the signatory--

(1) Is the person in the bidder's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(l) through (a)(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(l) through (a)(3) above.

_____ [insert full name of person(s) in the bidder's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the bidder's organization];

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the bidder deletes or modifies subparagraph (a)2 above, the bidder must furnish with its bid a signed statement setting forth in detail the circumstances of the disclosure.

[ ] [Contracting Officer check if following paragraph is applicable]

(d) Non-collusive affidavit. (applicable to contracts for construction and equipment exceeding $50,000)

(1) Each bidder shall execute, in the form provided by the PHA/IHA, an affidavit to the effect that he/she has not colluded with any other person, firm or corporation in regard to any bid submitted in response to this solicitation. If the successful bidder did not submit the affidavit with his/her bid, he/she must submit it within three (3) working days of bid opening. Failure to submit the affidavit by that date may render the bid nonresponsive. No contract award will be made without a properly executed affidavit.

(2) A fully executed "Non-collusive Affidavit" [ ] is, [ ] is not included with the bid.

2. Contingent Fee Representation and Agreement

(a) Definitions. As used in this provision:

"Bona fide employee" means a person, employed by a bidder and subject to the bidder's supervision and control as to time, place, and manner of performance, who neither exerts, nor proposes to exert improper influence to solicit or obtain contracts nor holds out as being able to obtain any contract(s) through improper influence.

"Improper influence" means any influence that induces or tends to induce a PHA/IHA employee or officer to give consideration or to act regarding a PHA/IHA contract on any basis other than the merits of the matter.

(b) The bidder represents and certifies as part of its bid that, except for full-time bona fide employees working solely for the bidder, the bidder:

(1) [ ] has, [ ] has not employed or retained any person or company to solicit or obtain this contract; and

(2) [ ] has, [ ] has not paid or agreed to pay to any person or company employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

(c) If the answer to either (a)(1) or (a)(2) above is affirmative, the bidder shall make an immediate and full written disclosure to the PHA/IHA Contracting Officer.

(d) Any misrepresentation by the bidder shall give the PHA/IHA the right to (1) terminate the contract; (2) at its discretion, deduct from contract payments the amount of any commission, percentage, brokerage, or other contingent fee; or (3) take other remedy pursuant to the contract.

3. Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions (applicable to contracts exceeding $100,000)

(a) The definitions and prohibitions contained in Section 1352 of title 31, United States Code, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The bidder, by signing its bid, hereby certifies to the best of his or her knowledge and belief as of December 23, 1989 that:

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of a contract resulting from this solicitation;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the bidder shall complete and submit, with its bid, OMB standard form LLL, "Disclosure of Lobbying Activities;" and

(3) He or she will include the language of this certification in all subcontracts at any tier and require that all recipients of subcontract awards in excess of $100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

(d) Indian tribes (except those chartered by States) and Indian organizations as defined in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) are exempt from the requirements of this provision.

4. Organizational Conflicts of Interest Certification

The bidder certifies that to the best of its knowledge and belief and except as otherwise disclosed, he or she does not have any organizational conflict of interest which is defined as a situation in which the nature of work to be performed under this proposed contract and the bidder's organizational, financial, contractual, or other interests may, without some restriction on future activities:

(a) Result in an unfair competitive advantage to the bidder; or,

(b) Impair the bidder's objectivity in performing the contract work.

[ ] In the absence of any actual or apparent conflict, I hereby certify that to the best of my knowledge and belief, no actual or apparent conflict of interest exists with regard to my possible performance of this procurement.

5. Bidder's Certification of Eligibility

(a) By the submission of this bid, the bidder certifies that to the best of its knowledge and belief, neither it, nor any person or firm which has an interest in the bidder's firm, nor any of the bidder's subcontractors, is ineligible to:

(1) Be awarded contracts by any agency of the United States Government, HUD, or the State in which this contract is to be performed; or,

(2) Participate in HUD programs pursuant to 24 CFR Part 24.

(b) The certification in paragraph (a) above is a material representation of fact upon which reliance was placed when making award. If it is later determined that the bidder knowingly rendered an erroneous certification, the contract may be terminated for default, and the bidder may be debarred or suspended from participation in HUD programs and other Federal contract programs.

6. Minimum Bid Acceptance Period

(a) "Acceptance period," as used in this provision, means the number of calendar days available to the PHA/IHA for awarding a contract from the date specified in this solicitation for receipt of bids.

(b) This provision supersedes any language pertaining to the acceptance period that may appear elsewhere in this solicitation.

(c) The PHA/IHA requires a minimum acceptance period of [Contracting Officer insert time period] calendar days.

(d) In the space provided immediately below, bidders may specify a longer acceptance period than the PHA's/IHA's minimum requirement. The bidder allows the following acceptance period: calendar days.

(e) A bid allowing less than the PHA's/IHA's minimum acceptance period will be rejected.

(f) The bidder agrees to execute all that it has undertaken to do, in compliance with its bid, if that bid is accepted in writing within (1) the acceptance period stated in paragraph (c) above or (2) any longer acceptance period stated in paragraph (d) above.

7. Small, Minority, Women-Owned Business Concern Representation

The bidder represents and certifies as part of its bid/ offer that it --

(a) [ ] is, [ ] is not a small business concern. "Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding, and qualified as a small business under the criteria and size standards in 13 CFR 121.

(b) [ ] is, [ ] is not a women-owned business enterprise. "Women-owned business enterprise," as used in this provision, means a business that is at least 51 percent owned by a woman or women who are U.S. citizens and who also control and operate the business.

(c) [ ] is, [ ] is not a minority business enterprise. "Minority business enterprise," as used in this provision, means a business which is at least 51 percent owned or controlled by one or more minority group members or, in the case of a publicly owned business, at least 51 percent of its voting stock is owned by one or more minority group members, and whose management and daily operations are controlled by one or more such individuals. For the purpose of this definition, minority group members are:

(Check the block applicable to you)

[ ] Black Americans	[ ] Asian Pacific Americans
[ ] Hispanic Americans	[ ] Asian Indian Americans
[ ] Native Americans	[ ] Hasidic Jewish Americans

8. Indian-Owned Economic Enterprise and Indian Organization Representation (applicable only if this solicitation is for a contract to be performed on a project for an Indian Housing Authority)

The bidder represents and certifies that it:

(a) [ ] is, [ ] is not an Indian-owned economic enterprise. "Economic enterprise," as used in this provision, means any commercial, industrial, or business activity established or organized for the purpose of profit, which is at least 51 percent Indian owned. "Indian," as used in this provision, means any person who is a member of any tribe, band, group, pueblo, or community which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs and any "Native" as defined in the Alaska Native Claims Settlement Act.

(b) [ ] is, [ ] is not an Indian organization. "Indian organization," as used in this provision, means the governing body of any Indian tribe or entity established or recognized by such governing body. Indian "tribe" means any Indian tribe, band, group, pueblo, or

community including Native villages and Native groups (including corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs.

9. Certification of Eligibility Under the Davis-Bacon Act (applicable to construction contracts exceeding $2,000)

(a) By the submission of this bid, the bidder certifies that neither it nor any person or firm who has an interest in the bidder's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of the contract resulting from this solicitation shall be subcontracted to any person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(c) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

10. Certification of Nonsegregated Facilities (applicable to contracts exceeding $10,000)

(a) The bidder's attention is called to the clause entitled **Equal Employment Opportunity** of the General Conditions of the Contract for Construction.

(b) "Segregated facilities," as used in this provision, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise.

(c) By the submission of this bid, the bidder certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The bidder agrees that a breach of this certification is a violation of the Equal Employment Opportunity clause in the contract.

(d) The bidder further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) prior to entering into subcontracts which exceed $10,000 and are not exempt from the requirements of the Equal Employment Opportunity clause, it will:

(1) Obtain identical certifications from the proposed subcontractors;

(2) Retain the certifications in its files; and

(3) Forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

Notice to Prospective Subcontractors of Requirement for Certifications of Nonsegregated Facilities

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Employment Opportunity clause of the prime contract. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

Note: The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

11. Clean Air and Water Certification (applicable to contracts exceeding $100,000)

The bidder certifies that:

(a) Any facility to be used in the performance of this contract [ ] is, [ ] is not listed on the Environmental Protection Agency List of Violating Facilities:

(b) The bidder will immediately notify the PHA/IHA Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the Environmental Protection Agency, indicating that any facility that the bidder proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and,

(c) The bidder will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

12. Previous Participation Certificate (applicable to construction and equipment contracts exceeding $50,000)

(a) The bidder shall complete and submit with his/her bid the Form HUD-2530, "Previous Participation Certificate." If the successful bidder does not submit the certificate with his/her bid, he/she must submit it within three (3) working days of bid opening. Failure to submit the certificate by that date may render the bid nonresponsive. No contract award will be made without a properly executed certificate.

(b) A fully executed "Previous Participation Certificate"

[ ] is, [ ] is not included with the bid.

13. Bidder's Signature

The bidder hereby certifies that the information contained in these certifications and representations is accurate, complete, and current.

_____
(Signature and Date)

_____
(Typed or Printed Name)

_____
(Title)

_____
(Company Name)

(Company Address)

OMB Approval No. 2502-0118
(Exp. 11/30/2022)

US Department of Housing and Urban Development
Office of Housing/Federal Housing Commissioner

US Department of Agriculture
Farmers Home Administration

Part I to be completed by Controlling Participant(s) of Covered Projects *(See instructions)* Reason for submission:		**For HUD HQ/FmHA use only**	
1. Agency name and City where the application is filed		**2**. Project Name, Project Number, City and Zip Code	
3. Loan or Contract amount $	**4**. Number of Units or Beds	**5**. Section of Act	**6**. Type of Project (check one) ☐ Existing ☐ Rehabilitation ☐ Proposed (New)

7. List all proposed Controlling Participants and attach complete organization chart for all organizations showing ownership %

Name and address (Last, First, Middle Initial) of controlling participant(s) proposing to participate	**8 Role of Each Principal in Project**	**9. SSN or IRS Employer Number (TIN)**

Certifications: The controlling participants(s) listed above hereby apply to HUD or USDA FmHA, as the case maybe, for approval to participate as controlling participant(s) in the role(s) and project listed above. The controlling participant(s) certify that the information provided on this form and in any accompanying documentation is true and accurate. I/we acknowledge that making, presenting, or submitting a false, fictitious, or fraudulent statement, representation, or certification may result in criminal, civil, and/or administrative sanctions, including fines, penalties, and imprisonment. The controlling participants(s) further certify to the truth and accuracy of the following:

1. Schedule A contains a listing, for the last ten years, of every project assisted or insured by HUD, USDA FmHA and/or State and local government housing finance agencies in which the controlling participant(s) have participated or are now participating.
2. For the period beginning 10 years prior to the date of this certification, and except as shown on the certification:
a. No mortgage on a project listed has ever been in default, assigned to the Government or foreclosed, nor has it received mortgage relief from the mortgagee;
b. The controlling participants have no defaults or noncompliance under any Conventional Contract or Turnkey Contract of Sale in connection with a public housing project;
c. There are no known unresolved findings as a result of HUD audits, management reviews or other Governmental investigations concerning the controlling participants or their projects;
d. There has not been a suspension or termination of payments under any HUD assistance contract due to the controlling participant's fault or negligence;
e. The controlling participants have not been convicted of a felony and are not presently the subject of a complaint or indictment charging a felony. (A felony is defined as any offense punishable by imprisonment for a term exceeding one year, but does not include any offense classified as a misdemeanor under the laws of a State and punishable by imprisonment of two years or less);
f. The controlling participants have not been suspended, debarred or otherwise restricted by any Department or Agency of the Federal Government or of a State Government from doing business with such Department or Agency;
g. The controlling participants have not defaulted on an obligation covered by a surety or performance bond and have not been the subject of a claim under an employee fidelity bond;
3. All the names of the controlling participants who propose to participate in this project are listed above.
4. None of the controlling participants is a HUD/FmHA employee or a member of a HUD/FmHA employee's immediate household as defined in Standards of Ethical Conduct for Employees of the Executive Branch in 5 C.F.R. Part 2635 (57 FR 35006) and HUD's Standard of Conduct in 24 C.F.R. Part 0 and USDA's Standard of Conduct in 7 C.F.R. Part 0 Subpart B.
5. None of the controlling participants is a participant in an assisted or insured project as of this date on which construction has stopped for a period in excess of 20 days or which has been substantially completed for more than 90 days and documents for closing, including final cost certification, have not been filed with HUD or FmHA.
6.None of the controlling participants have been found by HUD or FmHA to be in noncompliance with any applicable fair housing and civil rights requirements in 24 CFR 5.105(a). (If any controlling participants have been found to be in noncompliance with any requirements, attach a signed statement explaining the relevant facts, circumstances, and resolution, if any).
7. None of the controlling participants is a Member of Congress or a Resident Commissioner nor otherwise prohibited or limited by law from contracting with the Government of the United States of America.
8.Statements above (if any) to which the controlling participant(s) cannot certify have been deleted by striking through the words with a pen, and the controlling participant(s) have initialed each deletion (if any) and have attached a true and accurate signed statement (if applicable) to explain the facts and circumstances.

Name of Controlling Participant	**Signature of Controlling Participant**	**Certification Date (mm/dd/yyyy)**	**Area Code and Tel. No.**
This form prepared by (print name)		**Area Code and Tel. No.**	

Schedule A: List of Previous Projects and Section 8 Contracts. Below is a complete list of the controlling participants' previous participation projects and participation history in covered projects as per 24 CFR, part 200 §200.214 and multifamily Housing programs of FmHA, State and local Housing Finance Agencies, if applicable. **Note:** Read and follow the instruction sheet carefully. Make full disclosure. Add extra sheets if you need more space. Double check for accuracy. If no previous projects, write by your name, "**No previous participation, First Experience"**.

1. Controlling Participants' Name (Last, First)	2. List of previous projects (Project name, project ID and, Govt. agency involved)	3.List Participants' Role(s) (indicate dates participated, and if fee or identity of interest participant)	4. Status of loan (current, defaulted, assigned, foreclosed)	5.Was the Project ever in default during your participation **Yes**	**No**	**If yes, explain**	6. Last MOR rating and Physical Insp. Score and date

Part II- For HUD Internal Processing Only

Received and checked by me for accuracy and completeness; recommend approval or refer to Headquarters after checking appropriate box.

Date (mm/dd/yyyy)	Tel No. and area code	☐ A. No adverse information; form HUD-2530 approval recommended.	☐ C. Disclosure or Certification problem
Staff	Processing and Control	☐ B. Name match in system	☐ D. Other (attach memorandum)

Signature of authorized reviewer	Signature of authorized reviewer	Approved ☐ Yes ☐ No	Date (mm/dd/yyyy)

Instructions for Completing the Previous Participation Certificate, form HUD-2530

Carefully read these instructions and the applicable regulations. A copy of the regulations published at 24 C.F.R. part 200, subpart H, § 200.210-200.222 can be obtained on-line at www.gpo.gov and from the Account Executive at any HUD Office. Type or print neatly in ink when filling out this form. Incomplete form will be returned to the applicant.

Attach extra sheets as you need them. Be sure to indicate "Continued on Attachments" wherever appropriate. Sign each additional page that you attach if it refers to you or your record. **Carefully read the certification before you sign it.** Any questions regarding the form or how to complete it can be answered by your HUD Account Executive.

Purpose: This form provides HUD/USDA FmHA with a certified report of all previous participation in relevant HUD/USDA programs by those parties submitting the application. The information requested in this form is used by HUD/USDA to determine if you meet the standards established to ensure that all controlling participants in HUD/USDA projects will honor their legal, financial and contractual obligations and are of acceptable risks from the underwriting standpoint of an insurer, lender or governmental agency. HUD requires that you certify and submit your record of previous participation, in relevant projects, by completing and signing this form, before your participation can be approved.

HUD approval of your certification is a necessary precondition for your participation in the project and in the capacity that you propose. If you do not file this certification, do not furnish the information requested accurately, or do not meet established standards, HUD will not approve your certification.

Note that approval of your certification does not obligate HUD to approve your project application, and it does not satisfy all other HUD program requirements relative to your qualifications.

Who Must Sign and File Form HUD-2530: Form HUD-2530 must be completed and signed by all Controlling Participants of Covered Projects, as such terms are defined in 24 CFR part 200 §200.212, and as further clarified by the Processing Guide (HUD notice H 2016-15) referenced in 24 CFR §200.210(b) and available on the HUD website at: http://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/mfh/prevparticipation.

Where and When Form HUD-2530 Must Be Filed: The original of this form must be submitted to the HUD Office where your project application will be processed at the same time you file your initial project application. This form must be filed with applications for projects listed in 24 CFR §200.214 and for the Triggering Events listed at 24 CFR §200.218.

Review of Adverse Determination: If approval of your participation in a HUD project is denied, withheld, or conditionally granted on the basis of your record of previous participation, you will be notified by the HUD Office. You may request reconsideration in accordance with 24 CFR §200.222 and further clarified by the Processing Guide. Request must be made in writing within 30 days from your receipt of the notice of determination.

The Department of Housing and Urban Development (HUD) is authorized to collect this information by law 42 U.S.C. 3535(d) and by regulation at 24 CFR 200.210. This information is needed so that principals applying to participate in multifamily programs can become HUD-approved controlling participants. The information you provide will enable HUD to evaluate your record with respect to established standards of performance, responsibility and eligibility. Without prior approval, a controlling participant may not participate in a proposed or existing multifamily or healthcare project. HUD uses this information to evaluate whether or not controlling participants pose an unsatisfactory underwriting risk. The information is used to evaluate the potential controlling participants and approve only individuals and organizations that will honor their legal, financial and contractual obligations.

Privacy Act Statement: The Housing and Community Development Act of 1987, 42 U.S.C. 3543 requires persons applying for a Federally-insured or guaranteed loan to furnish his/her Social Security Number (SSN). HUD must have your SSN for identification of your records. HUD may use your SSN for automated processing of your records and to make requests for information about you and your previous records with other public agencies and private sector sources. HUD may disclose certain information to Federal, State and local agencies when relevant to civil, criminal, or regulatory investigations and prosecutions. It will not be otherwise disclosed or released outside of HUD, except as required and permitted by law. You must provide all of the information requested in this application, including your SSN.
Purpose: The information collected by form HUD-2530 is required for principals applying to participate in multifamily programs to become HUD-approved controlling participants. The information you provide will enable HUD to evaluate your record with respect to established standards of performance, responsibility, and eligibility.
Routine Use: The information collected by this form will not be otherwise disclosed outside of HUD, except to public agencies and private sector sources for automated processing of your records and for requesting information about you for participant approval; to appropriate agencies, entities, and persons when it is reasonably necessary to mitigate a breach or related incident; to Federal, state and/or local agencies when relevant to civil, criminal, or regulatory investigations and prosecutions or for other inquiries.
Disclosure: Providing the information is voluntary. You must provide all information requested in this application, including your SSN. Without prior approval or information, a controlling participant may not participate in a proposed or existing multifamily or healthcare project.
SORN ID/URL:https://www.govinfo.gov/content/pkg/FR-2016-07-29/pdf/2016-18026.pdf

Public reporting burden for this collection of information is estimated to average three hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. This agency may not collect this information, and you are not required to complete this form, unless it displays a currently valid OMB control number.

A response is mandatory. Failure to provide any of the information will result in your disapproval of participation in this HUD program.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion Lower Tier Covered Transactions*

(*Note: Lower Tier refers to the agency or contractor receiving Federal funds, as well as any subcontractors that the agency or contractor enters into contract with using those funds.)

Title 24 Code of Federal Regulations Part 24 requires that Augusta Housing Authority (AHA) not enter into contract with any agency, corporation. partnership, or other legal entity that has been debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by the Federal Government from participating in transactions involving Federal funds. You are required to sign the certification below which specifies that neither you nor your principals are presently debarred, suspended. proposed for debarment, declared ineligible, or voluntarily excluded from participation in programs funded by a Federal agency. It also certifies that you will not use, directly or indirectly, any of these funds to employ, award contracts to, engage the services of, or fund any contractor that is debarred, suspended, or ineligible under 24 Code of Federal Regulations Part 24.

If you need to determine whether your agency/firm has been debarred or suspended, or if a subcontractor you plan to hire is suspended or debarred, please refer to the following sources:

- *List of Parties Excluded From Federal Procurement and Nonprocurement Programs, issued by the U.S. General Services Administration, Office of Acquisition Policy. Contact the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402 (Reference Stock # 722-002-00000-8). The telephone number is 202-512-1800.*

- *Internet access is also available at http://epls.arnet.gov*

Instructions for Certification

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
3. The prospective lower tier participant shall provide immediate written notice to the person to whom this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or had become erroneous by reason of changed circumstances.
4. The terms covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded, as used in this clause, have the meaning set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled ``Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not proposed for debarment under 48 CFR part 9, subpart 9.4, debarred,

suspended, ineligible, or voluntarily excluded from covered transactions, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion Lower Tier Covered Transactions

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency;

(b) Have not within a three year period preceding the effective date of this contract been convicted of or had a civil judgment rendered against me or _____
(Contractor's/Company Name)
for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

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

(2) Where the prospective primary participant is unable to certify to any of these statements in this certification, such prospective participant shall attach an explanation to this proposal.

Signed: _____ Date: _____
(Authorized Recipient Name/Title)

Print Name: _____

Organization: _____

NON-COLLUSIVE AFFIDAVIT

State of)
ss.
County of)

being first duly sworn, deposes and says,

That he or she is_____,
the party making the foreseeing proposal or bid, that such proposal or bid is genuine and not collusive or sham; that said offeror has not colluded, conspired, connived or agreed, directly or indirectly, with any offeror or person to put in a sham bid or to refrain from bidding, and has not in any manner, directly or indirectly, sought by agreement or collusion, or communication, or conference, with any person, to fix the bid price or any other offeror, or to fix any overhead, profit or cost element of said bid price, or of that of any other offeror, or to secure any advantage against the Augusta Housing Authority or any person interested in the proposed contract; and that all statements in said proposal or bid are true.

Signature: _____

Title: _____

_____
(Company Name)

Offeror, if the Offeror is an Individual
Partner, if the Offeror is a Partnership
Officer, if the Offeror is a Corporation

Subscribed and sworn to before me,

This _____ day of _____, 20____

My Commission expires _____, 20 ____

Certification for a Drug-Free Workplace

U.S. Department of Housing and Urban Development

Applicant Name

Program/Activity Receiving Federal Grant Funding

Acting on behalf of the above named Applicant as its Authorized Official, I make the following certifications and agreements to the Department of Housing and Urban Development (HUD) regarding the sites listed below:

I certify that the above named Applicant will or will continue to provide a drug-free workplace by:

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

b. Establishing an on-going drug-free awareness program to inform employees ---

(1) The dangers of drug abuse in the workplace;

(2) The Applicant's policy of maintaining a drug-free workplace;

(3) Any available drug counseling, rehabilitation, and employee assistance programs; and

(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace.

c. Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph a.;

d. Notifying the employee in the statement required by paragraph a. that, as a condition of employment under the grant, the employee will ---

(1) Abide by the terms of the statement; and

(2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

e. Notifying the agency in writing, within ten calendar days after receiving notice under subparagraph d.(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the Federalagency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

f. Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph d.(2), with respect to any employee who is so convicted ---

(1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or

(2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

g. Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs a. thru f.

2. Sites for Work Performance. The Applicant shall list (on separate pages) the site(s) for the performance of work done in connection with the HUD funding of the program/activity shown above: Place of Performance shall include the street address, city, county, State, and zip code. Identify each sheet with the Applicant name and address and the program/activity receiving grant funding.)

Check here ☐ if there are workplaces on file that are not identified on the attached sheets.

I hereby certify that all the information stated herein, as well as any information provided in the accompaniment herewith, is true and accurate.

Warning: HUD will prosecute false claims and statements. Conviction may result in criminal and/or civil penalties. (18 U.S.C. 1001, 1010, 1012; 31 U.S.C. 3729, 3802)

Name of Authorized Official	Title

Signature	Date
X	

Required Participation in E-Verify by all Contractors, Subcontractors, and Sub-subcontractors

2011 HOUSE BILL 87 RESOURCES

SECTION 3 AFFIDAVITS

Section 3 of House Bill 87 amends O.C.G.A. §13-10-91.
O.C.G.A. §13-10-91(b)(1) states, in part, "A public employer shall not enter into a contract … for the physical performance of services unless the contractor registers and participates in the federal work authorization program. Before a bid for any such service is considered by a public employer, the bid shall include a signed, notarized affidavit from the contractor…." O.C.G.A. §13-10-91(b)(6) states, in part, "No later than August 1, 2011, the Department of Audits and Accounts shall create and post on its website form affidavits for the federal work authorization program." The Department of Audits and Accounts requested the assistance of the Department of Law to draft the affidavits required by this Code section:

Contractor Affidavit under O.C.G.A. §13-10-91(b)(1) **[PDF] [Microsoft Word]**
Subcontractor Affidavit under O.C.G.A. §13-10-91(b)(3) **[PDF] [Microsoft Word]**
Sub-subcontractor Affidavit under O.C.G.A. §13-10-91(b)(4) **[PDF] [Microsoft Word]**

This Code section addresses contracts for the physical performance of services. The Department of Law has been requested to provide guidance on the applicability of this Code section to contracts other than public works contracts. Public employers, as defined in O.C.G.A. §13-10-90, are strongly encouraged to review the guidance in the following PDF. The Georgia Department of Audits and Accounts' staff cannot provide legal advice or legal assistance regarding this guidance. Please consult your agency's attorney if you need legal advice or legal assistance beyond what is provided.

Contractor Affidavit under O.C.G.A. § 13-10-91(b)(1)

By executing this affidavit, the undersigned contractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services on behalf of **The Housing Authority of the City of Augusta GA** has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in
O.C.G.A. § 13-10-91. Furthermore, the undersigned contractor will continue to use the federal work authorization program throughout the contract period and the undersigned contractor will contract for the physical performance of services in satisfaction of such contract only with subcontractors who present an affidavit to the contractor with the information required by O.C.G.A. § 13-10-91(b). Contractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

_____
Federal Work Authorization User Identification Number

_____
Date of Authorization

_____
Name of Contractor

_____
Name of Project

_____
Name of Public Employer

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

Executed on _____, ___, 201__ in _____(city), _____(state).

_____
Signature of Authorized Officer or Agent

_____
Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____,201__.

_____
NOTARY PUBLIC

My Commission Expires:

_____

Subcontractor Affidavit under O.C.G.A. § 13-10-91(b)(3)

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

Federal Work Authorization User Identification Number

_____

Date of Authorization

_____

Name of Subcontractor

_____

Name of Project

_____

Name of Public Employer

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

Executed on _____, ___, 201__ in _____(city), _____(state).

_____

Signature of Authorized Officer or Agent

_____

Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____,201__.

_____

NOTARY PUBLIC

My Commission Expires:

_____

Sub-subcontractor Affidavit under O.C.G.A. § 13-10-91(b)(4)

By executing this affidavit, the undersigned sub-subcontractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services under a contract for (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract) and (name of contractor) on behalf of **The Housing Authority of the City of Augusta GA** has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned sub-subcontractor will continue to use the federal work authorization program throughout the contract period and the undersigned sub-subcontractor will contract for the physical performance of services in satisfaction of such contract only with sub-subcontractors who present an affidavit to the sub-subcontractor with the information required by O.C.G.A. § 13-10-91(b). The undersigned sub-subcontractor shall submit, at the time of such contract, this affidavit to (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract). Additionally, the undersigned sub-subcontractor will forward notice of the receipt of any affidavit from a sub-subcontractor to (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract). Sub-subcontractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

_____
Federal Work Authorization User Identification Number

_____
Date of Authorization

_____
Name of Sub-subcontractor

_____
Name of Project

_____
Name of Public Employer

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

Executed on _____, ___, 201__ in _____(city), _____(state).

_____
Signature of Authorized Officer or Agent

_____
Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____,201__.

_____
NOTARY PUBLIC
My Commission Expires:

_____

OFFICIAL NOTICE

RESIDENTIAL AND GENERAL CONTRACTORS MUST BE LICENSED EFFECTIVE JULY 1, 2008

Pursuant to Georgia law O.C.G.A. 43-41, the following contractor types must obtain a license from the **Georgia State Board of Residential and General Contractors** by July 1, 2008:

- **Residential-Basic Contractor:** Those who perform contract work relative to detached one-family and two-family residences and one-family townhouses not over three stories in height.
- **Residential-Light Commercial Contractor:** Those who perform contract work or activity related to multifamily and multiuse light commercial buildings and structures.
- **General Contractor:** Those who perform unlimited contractor services in commercial construction, including private, public, institutional and industrial contracting.
- **General Contractor Limited Tier:** Those who perform contractor services in commercial construction, including private, public, institutional and industrial contracting. These contractors have an established limit of $500,000.00 per contract.
- **All applicants for licensure must pass a two part examination:** A practical section related to the license they are trying to obtain and a business and law section. Applications for examination may be found on the Board's website at: www.sos.ga.gov/plb/contractors. Once approved by the Board to sit for the examination, applicants will receive a letter with instructions to schedule the examination. Examinations are offered Mondays through Fridays in Atlanta, Macon, and Tifton.

For a comprehensive list of frequently asked questions, forms, state laws, and board rules, please visit: www.sos.ga.gov/plb/contractors.

Georgia State Board Residential and General Contractors
P.O. Box 13446 ● Macon, Georgia 31208 ● 478-207-2440
www.sos.ga.gov/plb/contractors

Section 3 Final Rule

Implementation Plan

Section 3
Final Rule

Version Number	Date Updated	Summary of Changes
1.0	4/21/2022	Section 3 Final Rule Initial Draft

Section 3 Plan

Table of Contents

Original Section 3 Plan: 4-18-2011

Revision #1: 4-20-2012
Revision #2: 4-18-2013
Revision #3: 4-15-2014
Revision #4: 4-16-2015
Revision #5: 4-22-2016
Revision #6: 4-20-2017
Revision #7: 4-15-2018
Revision #8: 4-18-2019
Revision #9: 4-12-2020
Revision #10: 4-25-2021
Revision #11: 4-21-2022

AHA Update as of: April 21, 2022

1. Overview of Section 3 Requirements

A. WHAT IS SECTION 3?

Section 3 is a provision of the Housing and Urban Development Act of 1968 (12 U.S.C. 1701u) that is regulated by the provisions of 24 CFR Part 75. Section 3 regulations ensure that employment and other economic opportunities generated by certain HUD financial assistance shall, to the greatest extent feasible, and consistent with existing Federal, State, and local laws and regulations, be directed to low- and very low-income persons, particularly those who are recipients of government assistance for housing, and to business concerns which provide economic opportunities to low- and very low-income persons.

B. PURPOSE OF THIS DOCUMENT

This plan outlines how the Housing Authority of the City of Augusta, GA and its subrecipients, contractors and subcontractors will comply with HUD's Section 3 requirements in implementing of Section 3 of the HUD act of 1968, as amended in 1994. The Housing Authority of the City of Augusta, GA will, to the greatest extent feasible, ensure that employment and other economic opportunities are directed to low- and very low-income persons (Section 3 workers and Targeted Section 3 workers) and to eligible businesses (Section 3 Businesses) and requires the same of its contractors.

The Housing Authority of the City of Augusta, GA may amend its Section 3 Policies and Procedures document as necessary to ensure continued compliance with HUD's requirements and/or to reflect updated Section 3 guidance and outreach strategies.

C. APPLICABILITY

For public housing financial assistance, all funding is covered, regardless of the amount of expenditure or size of a contract. This plan applies to development assistance, operating funds, capital funds, and all mixed-finance development.

For housing and community development financial assistance, this plan applies to housing rehabilitation, housing construction, and other public construction projects that exceed $200,000 or more of housing and community development financial assistance from one or more HUD programs. Applicability is determined at the project level.

For projects funded with Lead and Hazard Control and Healthy Homes Programs, this plan applies to projects that exceed $100,000.

This plan also applies to projects that include multiple funding sources. Multiple funding source projects include projects that include public housing financial assistance, housing, and community development financial assistance for single or multiple recipients, and the Lead Hazard Control and Healthy Homes Program.

Section 3 requirements **do not** apply to: 1) Material Supply Contracts - § 75.3(b), 2) Indian and Tribal Preferences - § 75.3(c), and 3) Other HUD assistance and other Federal assistance not subject to Section 3 §75.3 (d). However, for financial assistance that is not subject to Section 3, recipients are encouraged to consider ways to support the purpose of Section 3.

2. Section 3 Coordinator

The Housing Authority of the City of Augusta, GA's Section 3 Coordinator serves as the central point of contact for Section 3 compliance for the Housing Authority of the City of Augusta, GA and its subrecipients, contractors and subcontractors supporting the program. Subrecipients, contractors, subcontractors and others are encouraged to reach out to the Housing Authority of the City of Augusta, GA's Section 3 Coordinator with questions regarding Section 3 compliance:

Jill Kirkland
Contract & 504 Coordinator
jkirkland@augustapha.org

3. Employment, Training, and Contracting Goals

A. SAFE HARBOR COMPLIANCE

The Housing Authority of the City of Augusta, GA will be considered to have complied with the Section 3 requirements and met safe harbor, if they certify that they followed the required prioritization of effort and met or exceeded the Section 3 benchmarks, absent evidence of the contrary.

Prior to the beginning of work, contractors and subcontractors will be required to certify that they will follow the required prioritization of effort for Section 3 workers, Targeted Section 3 workers, and Section 3 business concerns as outlined below in section C. After completion of the project, on the Section 3 Cumulative Report, contractors and subcontractors will be required to certify that they followed the prioritization of effort requirements.

If the contractor and subcontractor does not meet the safe harbor requirements, they must provide evidence that they have made qualitative efforts to assist low and very low-income persons with employment and training opportunities.

B. SAFE HARBOR BENCHMARKS

The Housing Authority of the City of Augusta, GA has established employment and training goals that subrecipients, contractors, and subcontractors should meet in order to comply with Section 3 requirements outlined in 24 CFR Part 75.9 - for public housing financial assistance. The safe harbor benchmark goals are as follows:

1) Twenty-five (25) percent or more of the total number of labor hours worked by all workers employed with public housing financial assistance in the PHA's fiscal year are Section 3 workers;

   Section 3 Labor Hours/Total Labor Hours = 25%

And

2) Five (5) percent or more of the total number of labor hours worked by all workers employed with public housing financial assistance in the PHA's fiscal year are Targeted Section 3 workers, as defined at 24 CFR Part 75.11.

   Targeted Section 3 Labor Hours/Total Labor Hours = 5%

HUD establishes and updates Section 3 benchmarks for Section 3 workers and/or Targeted Section 3 workers through a document published in the Federal Register, not less frequently than once every 3 years. Given that the Section 3 benchmarks are subject to change every three years or sooner, The Housing Authority of the City of Augusta, GA will review and update the Section 3 Plan every 3 years, as needed.

It is the responsibility of contractors to implement efforts to achieve Section 3 compliance. Any contractor that does not meet the Section 3 benchmarks must demonstrate why meeting the benchmarks were not feasible. All contractors submitting bids or proposals to the Housing Authority of the City of Augusta, GA are required to certify that they will comply with the requirements of Section 3.

C. CERTIFICATION OF PRIORITIZATION OF EFFORT FOR EMPLOYMENT, TRAINING, AND CONTRACTING

EMPLOYMENT AND TRAINING

Under the Housing Authority of the City of Augusta, GA's Section 3 Program, contractors and subcontractors should make best efforts to provide employment and training opportunities to Section 3 workers in the priority order listed below:

1) To residents of the public housing projects for which the public housing financial assistance is expended;

2) To residents of other public housing projects managed by the PHA that is providing the assistance or for residents of Section 8-assisted housing managed by the PHA;

3) To participants in YouthBuild programs; and

4) To low- and very low-income persons residing within the metropolitan area (or nonmetropolitan county) in which the assistance is expended.

Contractors and subcontractors will be required to certify that they will and have made best efforts to follow the prioritization of effort requirements prior to the beginning work and after work is completed.

CONTRACTING

Under the Housing Authority of the City of Augusta, GA's Section 3 Program, contractors and subcontractors must make their best efforts to award contracts and subcontracts to business concerns that provide economic opportunities to Section 3 workers in the following order or priority:

1) Section 3 business concerns that provide economic opportunities for residents of public housing projects for which the assistance is provided;

2) Section 3 business concerns that provide economic opportunities for residents of other public housing projects or Section-8 assisted housing managed by the PHA that is providing assistance;

3) YouthBuild programs; and

4) Section 3 business concerns that provide economic opportunities to Section 3 workers residing within the metropolitan area (or nonmetropolitan county) in which the assistance is provided.

Contractors and subcontractors will be required to certify that they will and have made best efforts to follow the prioritization of effort requirements prior to the beginning work and after work is completed.

4. Section 3 Eligibility and Certifications

Individuals and businesses that meet Section 3 criteria may seek Section 3 preference from The Housing Authority of the City of Augusta, GA or its contractors/subcontractors for training, employment, or contracting opportunities generated by public housing financial assistance. To qualify as a Section 3 worker, Targeted Section 3 worker, or a Section 3 business concern, each must self-certify that they meet the applicable criteria.

Businesses who misrepresent themselves as Section 3 business concerns and report false information to The Housing Authority of the City of Augusta, GA may have their contracts terminated as default and be barred from ongoing and future considerations for contracting opportunities.

A. SECTION 3 WORKER AND TARGETED SECTION 3 WORKER CERTIFICATION

A Section 3 worker seeking certification shall submit self-certification documentation to the recipient contractor or subcontractor, that the person is a Section 3 worker or Targeted Section 3 worker as defined in 24 CFR Part 75. For the purposes of Section 3 worker eligibility, The Housing Authority of the City of Augusta, GA will use individual income rather than family/household income to determine eligibility. The income limits will be determined annually using the guidelines published at https://www.huduser.org/portal/datasets/il.html.

Persons seeking the Section 3 worker preference shall demonstrate that it meets one or more of the following criteria currently or when hired within the past five years, as documented:

1) A low or very low-income resident (the worker's income for the previous or annualized calendar year is below the income limit established by HUD); or
2) Employed by a Section 3 business concern; or
3) A YouthBuild participant.

Persons seeking the Targeted Section 3 worker preference shall demonstrate that it meets one or more of the following criteria:

1) Employed by a Section 3 business concern or
2) Currently meets or when hired met at least one of the following categories as documented within the past five years:

a) A resident of public housing; or

b) A resident of other public housing projects or Section 8-assisted housing; or

c) A YouthBuild participant.

Section 3 workers and Targeted Section 3 workers who are seeking preference in training and employment must submit the Section 3 Worker and Targeted Section 3 Worker Certification Form. The certification procedure will consist of the following:

PROJECTS INVOLVING MULTIPLE SOURCES OF FUNDING

In cases where Section 3 covered projects include multiple sources of funds, including public housing financial assistance, the Housing Authority of the City of Augusta, GA must follow the definition of Targeted Section 3 worker and priorities as outlined in subpart B of Part 75.

In cases where Section 3 covered projects include multiple housing and development funding sources (financial assistance) from single or multiple recipients, the Housing Authority of the City of Augusta, GA will follow subpart C of Part 75. Refer to chart in Appendix B.

B. SECTION 3 BUSINESS CONCERN CERTIFICATION

The Housing Authority of the City of Augusta, GA encourages contractors and subcontractors to make best efforts to award contracts and subcontracts to Section 3 business concerns.

Businesses that believe they meet the Section 3 Business requirements can self-register in the HUD Business registry, here: http://www.hud.gov/Sec3Biz. Businesses may seek Section 3 Business Concern preference by demonstrating that it meets one or more of the following criteria:

1) At least 51 percent of the business is owned and controlled by low- or very low-income persons; or
2) At least 51 percent of the business is owned and controlled by current public housing residents or residents who currently live in Section 8-assisted housing; or
3) Over 75 percent of the labor hours performed for the business over the prior three-month period are performed by Section 3 workers.

Businesses that seek Section 3 preference shall certify to the Housing Authority of the City of Augusta, GA, contractors or subcontractors, that they meet the definitions provided in the above. Businesses may demonstrate eligibility by submitting the Section 3 Business Concern Certification Form, located in Appendix C. Section 3 Forms.

Section 3 Business Concern Certification Forms must be submitted at the time of bid/proposal. If the Housing Authority of the City of Augusta, GA previously approved the business concern to be Section 3 certified, then the certification can be submitted along with the bid, as long as the form is submitted within the prescribed expiration date. The Section 3 Business Concern Certification Form will expire after 6

months. Establishing a 6-month certification of eligibility period allows the Housing Authority of the City of Augusta, GA the ability to assess contractor performance to ensure the business is striving to meet the required goals.

5. Assisting Contractors with Achieving Section 3 Goals

In an effort to assist contractors with meeting or exceeding the Section 3 goals, the Housing Authority of the City of Augusta, GA will do the following:

1) Share Section 3 Plan with contractors and subcontractors and explain policies and procedures
2) Require contractors wishing to submit a bid/offer/proposal to attend pre-bid meeting
3) Require contractor to sign the Section 3 Plan at pre-construction conference
4) Review Section 3 benchmarks and prioritization of effort with contractors and subcontractors to ensure that the goals are understood. It is not intended for contractors and subcontractors to terminate existing employees, but to make every effort feasible to meet Section 3 benchmark goals by utilizing existing qualified workforce and by considering qualified eligible Section 3 workers and Targeted Section 3 workers (per the prioritization of effort outlined in Section #3) before any other person, when hiring additional employees is needed to complete proposed work to be performed with Section 3 program.
5) At the time of bid, require the contractor to present a list, of the number of total labor hours, Section 3 worker labor hours, and Targeted Section 3 worker labor hours expected to be generated from the initial contract and a list of projected number of available positions, to include job descriptions and wage rates.
6) Maintain a local Section 3 worker/Targeted Section 3 worker database and provide the contractor with a list of interested and qualified Section 3 workers and Targeted Section 3 workers and contact information.
7) Inform contractors about the HUD Section 3 Opportunity Portal https://hudapps.hud.gov/OpportunityPortal/
8) Require contractors to notify Section 3 Coordinator of their interests regarding employment of Section 3 workers prior to hiring.
9) Encourage local business to register on the HUD Business Registry and direct contractors to the HUD Section 3 Business Registry https://www.hud.gov/section3businessregistry
10) Leverage the Housing Authority of the City of Augusta, GA's communication outlets (social media, website, etc.) to effectively communicate employment and contracting opportunities that arise.
11) Require contractors to submit a list of core employees (including administrative, clerical, planning and other positions pertinent to the construction trades) at the time of contact award.

6. Section 3 Outreach

A. OUTREACH EFFORTS FOR EMPLOYMENT AND TRAINING

In order to educate and inform workers and contractors, the Housing Authority of the City of Augusta, GA's Section 3 Coordinator will be prepared to provide training and technical assistance on a regular basis per program guidelines. When training opportunities are available, contractors and subcontractors should, to the greatest extent feasible:

1) Notify the Section 3 Coordinator when training opportunities are available
2) Provide information/handouts about Section 3 training opportunities to potential Section 3 workers and Targeted Section 3 workers
3) Conduct an annual training for Section 3 workers and Section 3 businesses

Contractors and subcontractors should employ several active strategies to notify Section 3 workers and Targeted Section 3 workers of Section 3 job opportunities, including:

1) Clearly indicating Section 3 eligibility on all job postings with the following statement: "This job is a Section 3 eligible job opportunity. We encourage applications from individuals that are low income and/or live in Public Housing and/or receive a Section 8 voucher".
2) Including the Section 3 Worker and Targeted Section 3 Worker Self-Certification Form in all job postings
3) Working with the Section 3 Coordinator to connect Section 3 worker and Targeted Section 3 workers in the Housing Authority of the City of Augusta, GA database with opportunities and/or utilize the Section 3 Opportunity Portal to find qualified candidates
4) Establishing a current list of Section 3 eligible applicants
5) Contacting local community organizations and provide them with job postings for Section 3 eligible applicants; and
6) Coordinating a programmatic ad campaign, which results in widespread job posting across diverse ad networks including:
    a) Advertising job opportunities via social media, including LinkedIn and Facebook;
    b) Advertising job opportunities via flyer distributions and mass mailings and posting ad in common areas of housing developments and all public housing management offices;
    c) Contacting resident councils, resident management corporations, and neighborhood community organizations to request their assistance in notifying residents of available training and employment opportunities

B. OUTREACH EFFORTS FOR CONTRACTING

When contracting opportunities arise in connection with the Section 3 program, the Housing Authority of the City of Augusta, GA will employ the following strategies to notify Section 3 Business Concerns of Section 3 contracting opportunities, including but not limited to:

1) Adding Section 3 language to all RFPs, procurement documents, bid offerings and contracts.
2) Coordinating mandatory pre-bid meetings to inform Section 3 Business Concerns of upcoming contracting opportunities. The Section 3 Coordinator will participate in these meetings to explain and answer questions related to Section 3 policy.
3) Advertising contracting opportunities in local community papers and notices that provide general information about the work to be contracted and where to obtain additional information.
4) Providing written notice of contracting opportunities to all known Section 3 Business Concerns. The written notice will be provided in sufficient time to enable business concerns the opportunity to respond to bid invitations.
5) Coordinating with the prime contractor to publicize contracting opportunities for small businesses.
6) Coordinating with the Housing Authority of the City of Augusta, GA's Business/Economic Development Department and all other business assistance agencies and contractor associations to inform them of contracting opportunities and request their assistance in identifying Section 3 business concerns. Could include local community development organizations, business development agencies (Chamber of Commerce), and minority contracting associations.
7) Connecting Section 3 business concerns with resources to support business development to assist in obtaining contracting opportunities (e.g., bonding and insurance assistance, etc.). Contractors will also be encouraged to collaborate with the Housing Authority of the City of Augusta, GA as subcontract opportunities arise in an effort to notify eligible Section 3 business concerns about the contracting opportunities.

7. Section 3 Contracting Policy and Procedure

The Housing Authority of the City of Augusta, GA will incorporate Section 3 in its existing Procurement Policy and adopt a Section 3 Contracting Policy and Procedure to be included in all procurements generated for use with HUD funding. This policy and procedure contain requirements for making efforts to award contracts to Section 3 Business Concerns.

All contractors/businesses seeking Section 3 preference must, before submitting bids/proposals to the Housing Authority of the City of Augusta, GA be required to complete certifications, as appropriate. Such certifications shall be adequately supported with appropriate documentation as referenced in the Section 3 Business Concern Certification Form.

8. Section 3 Provisions/Contract Language

The Housing Authority of the City of Augusta, GA will include standard Section 3 language in all of its contracts to ensure compliance with regulations in 24 CFR Part 75. The Housing Authority of the City of Augusta, GA will take appropriate actions upon finding that a contractor is in violation of 24 CFR Part 75 and does not knowingly contract with any contractor that has been found in violation of the Section 3 regulations. On a periodic basis the Section 3 Coordinator will audit The Housing Authority of the City of Augusta, GA contractors for compliance with the minimum Section 3 requirements outlined in the Section 3 Plan.

In addition, contractors and subrecipients are required to include language in all Section 3 covered contracts or agreements for subcontractors to meet the requirements of 24 CFR Part 75.9 for public housing financial assistance.

For businesses, noncompliance with HUD's regulations in 24 CFR part 75 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

9. Reporting Requirements

For Section 3 covered contracts, contractors must submit the Section 3 Performance and Summary Report to the Housing Authority of the City of Augusta, GA's Section 3 Coordinator on a monthly basis, and the annual reporting requirement set forth in that form's instructions.

A. MONTHLY REPORTING

1) Contractors are required to submit monthly activity reports to the Housing Authority of the City of Augusta, GA's Section 3 Coordinator at mailto:jkirkland@augustapha.org by the 10th day of each month.

B. ANNUAL REPORTING

1) Once a project is completed, contractors must submit a final Section 3 cumulative report for the program year.
2) Upon the completion of a project, the Housing Authority of the City of Augusta, GA's Section 3 Coordinator will conduct a final review of the project's overall performance and compliance.
3) The Housing Authority of the City of Augusta, GA's Section 3 Coordinator will submit the Section 3 data to HUD thru SPEARS prior to the due date of the reporting period.

C. REPORTING ON PROJECTS WITH MULTIPLE FUNDING SOURCES

1) For Section 3 projects that include public housing financial assistance and housing and community development financial assistance, the Housing Authority of the City of Augusta, GA, and any other recipient will report on the project as a whole and will identify the multiple associated recipients.
2) For projects assisted with funding from multiple sources of housing and community development assistance that exceed the thresholds of $200,000 and $100,000 for Lead Hazard Control and Healthy Homes Programs (LHCHH), the Housing Authority of the City of Augusta, GA will follow subpart C of Part 75 and will report to the applicable HUD program office, as prescribed by HUD. Note: LHCHH assistance is not included in calculating whether the assistance exceeds the $200,000 threshold. HUD public housing financial assistance and HUD housing and community development financial assistance is not included in calculating whether the assistance exceeds the LHCHH $100,000 threshold. Refer to chart in Appendix B.

10. Internal Section 3 Complaint Procedure

In an effort to resolve complaints generated due to non-compliance through an internal process, the Housing Authority of the City of Augusta, GA encourages submittal of such complaints to its Section 3 Coordinator as follows:

1) Complaints of non-compliance should be filed in writing and must contain the name of the complainant and brief description of the alleged violation of 24 CFR Part 75.
2) Complaints must be filed within Thirty (30) calendar days after the complainant becomes aware of the alleged violation.
3) An investigation will be conducted if complaint is found to be valid. The Housing Authority of the City of Augusta, GA will conduct an informal, but thorough investigation affording all interested parties, if any, an opportunity to submit testimony and/or evidence pertinent to the complaint.
4) The Housing Authority of the City of Augusta, GA will provide written documentation detailing the findings of the investigation. The Housing Authority of the City of Augusta, GA will review the findings for accuracy and completeness before it is released to complainants. The findings will be made available no later than Sixty (60) days after the filing of complaint. If complainants wish to have their concerns considered outside of the Housing Authority of the City of Augusta, GA a complaint may be filed with:

The HUD program office responsible for the public housing financial assistance or the Section 3 project, or to the local HUD field office. These offices can be found through the HUD website, www.hud.gov/.

Complainants may be eligible to bring complaints under other federal laws. The U.S. Equal Employment Opportunity Commission (EEOC) is responsible for enforcing federal laws that make it illegal to discriminate against a job applicant or an employee because of the person's race, color, religion, sex (including pregnancy), national origin, age (40 or older), disability or genetic information (medical history or predisposition to disease). For more information about complainant rights, please contact EEOC at: www.EEOC.gov.

The Department of Labor Office of Federal Contract Compliance Programs (OFCCP) enforces, for the benefit of job seekers and wage earners, the contractual promise of affirmative action and equal employment opportunity required of those who do business with the Federal government. More information about the services they provide can be obtained at: http://www.dol.gov/ofccp/.

11. Appendices

APPENDIX A: DEFINITIONS

The terms *HUD, Public housing,* and *Public Housing Agency (PHA)* are defined in 24 CFR part 5.

The following definitions also apply to 24 CFR Part 75 HUD's Economic Opportunities for Low-and Very Low-Income Persons:

1937 Act means the United States Housing Act of 1937, 42 U.S.C. 1437 *et seq. activities related to Public Housing*

Contractor means any entity entering into a contract with:

(1) A recipient to perform work in connection with the expenditure of public housing financial assistance or for work in connection with a Section 3 project; or
(2) A subrecipient for work in connection with a Section 3 project.

Labor hours means the number of paid hours worked by persons on a Section 3 project or by persons employed with funds that include public housing financial assistance.

Low-income person means a person as defined in Section 3(b)(2) of the 1937 Act, at or below 80% AMI. Note that Section 3 worker eligibility uses individual income rather than family/household income.

Material supply contracts means contracts for the purchase of products and materials, including, but not limited to, lumber, drywall, wiring, concrete, pipes, toilets, sinks, carpets, and office supplies.

Professional services means non-construction services that require an advanced degree or professional licensing, including, but not limited to, contracts for legal services, financial consulting, accounting services, environmental assessment, architectural services, and civil engineering services.

Public housing financial assistance means assistance as defined in 24 CFR Part 75.3(a)(1).

Public housing project is defined in 24 CFR 905.108.

Recipient means any entity that receives directly from HUD public housing financial assistance or housing and community development assistance that funds Section 3 projects, including, but not limited to, any State, local government, instrumentality, PHA, or other public agency, public or private nonprofit organization.

Section 3 means Section 3 of the Housing and Urban Development Act of 1968, as amended (12 U.S.C. 1701u).

Section 3 business concern means:

(1) A business concern meeting at least one of the following criteria, documented within the last six-month period:

(i) It is at least 51 percent owned and controlled by low- or very low-income persons;

(ii) Over 75 percent of the labor hours performed for the business over the prior three-month period are performed by Section 3 workers; or

(iii) It is a business at least 51 percent owned and controlled by current public housing residents or residents who currently live in Section 8-assisted housing.

(2) The status of a Section 3 business concern shall not be negatively affected by a prior arrest or conviction of its owner(s) or employees.

(3) Nothing in this part shall be construed to require the contracting or subcontracting of a Section 3 business concern. Section 3 business concerns are not exempt from meeting the specifications of the contract.

Section 3 Coordinator is person tasked with overseeing all Section 3 responsibilities for the PHA/CD office.

Section 3 project means a project defined in 24 CFR Part 75.3(a)(2).

Section 3 worker means:

(1) Any worker who currently fits or when hired within the past five years fit at least one of the following categories, as documented:

(i) The worker's income for the previous or annualized calendar year is below the income limit established by HUD.

(ii) The worker is employed by a Section 3 business concern.

(iii) The worker is a YouthBuild participant.

(2) The status of a Section 3 worker shall not be negatively affected by a prior arrest or conviction.

(3) Nothing in this part shall be construed to require the employment of someone who meets this definition of a Section 3 worker. Section 3 workers are not exempt from meeting the qualifications of the position to be filled.

Section 8-assisted housing refers to housing receiving project-based rental assistance or tenant-based assistance under Section 8 of the 1937 Act.

Service area or the neighborhood of the project means an area within one mile of the Section 3 project or, if fewer than 5,000 people live within one mile of a Section 3 project, within a circle centered on the Section 3 project that is sufficient to encompass a population of 5,000 people according to the most recent U.S. Census.

Small PHA means a public housing authority that manages or operates fewer than 250 public housing units.

Subcontractor means any entity that has a contract with a contractor to undertake a portion of the contractor's obligation to perform work in connection with the expenditure of public housing financial assistance or for a Section 3 project.

Subrecipient has the meaning provided in the applicable program regulations or in 2 CFR 200.93.

Targeted Section 3 worker has the meanings provided in 24 CFR Part 75.11, 75.21, or 75.29, and does not exclude an individual that has a prior arrest or conviction.

Very low-income person means the definition for this term set forth in section 3(b)(2) of the 1937 Act (at or below 50% AMI).

YouthBuild programs refers to YouthBuild programs receiving assistance under the Workforce Innovation and Opportunity Act (29 U.S.C. 3226).

APPENDIX B: MULTIPLE FUNDING SOURCES - CHART

TYPE OF FINANCIAL ASSISTANCE	DEFINITIONS *TARGETED SECTION 3 WORKER	THRESHOLDS	PRIORITIZATION	$200,000 REPORTING
Public Housing and Housing and Community Development	**PHA** – must follow subpart B of Part 75 **HCD** – may follow subpart B or C of Part 75	None *Any amount of PH assistance triggers Section 3	**PHA** – must follow subpart B of Part 75 **HCD** – may follow subpart B or C of Part 75	**PHA** – must follow subpart B of Part 75 **HCD** – may follow subpart B or C of Part 75 Both - Must report on project as a whole and identify the multiple associated recipients
Multiple Sources of Housing and Community Development *(single or multiple recipients)*	Must follow subpart C of Part 75	Exceeds for Section 3 projects *LHCHHP exceeds $100,000	Must follow subpart C of Part 75	Must follow subpart C of Part 75 Must report on project as a whole and identify the multiple associated recipients Must report to the applicable HUD program office, as prescribed by HUD

APPENDIX C: SECTION 3 FORMS

Section 3 Business Concern Certification for Contracting

Instructions: Enter the following information and select the criteria that applies to certify your business' Section 3 Business Concern status.

Business Information

Name of Business _____

Address of Business _____

Name of Business Owner _____

Phone Number of Business Owner _____

Email Address of Business Owner _____

Preferred Contact Information

☐ Same as above

Name of Preferred Contact _____
Phone Number of Preferred Contact _____

Type of Business (select from the following options):

☐Corporation ☐Partnership ☐Sole Proprietorship ☐Joint Venture

Select from *ONE* of the following three options below that applies:

☐ At least 51 percent of the business is owned and controlled by low- or very low-income persons (Refer to income guidelines on page 4).

☐ At least 51 percent of the business is owned and controlled by current public housing residents or residents who currently live in Section 8-assisted housing.

☐ Over 75 percent of the labor hours performed for the business over the prior three-month period are performed by Section 3 workers (Refer to definition on page 4).

Business Concern Affirmation

I affirm that the above statements are true, complete, and correct to the best of my knowledge and belief. I understand that businesses who misrepresent themselves as Section 3 business concerns and report false information to [insert name of recipient/grantee] may have their contracts terminated as default and be barred from ongoing and future considerations for contracting opportunities. I hereby certify, under penalty of law, that the following information is correct to the best of my knowledge.

.

Print Name: _____

Signature: _____Date: _____

*Certification expires within six months of the date of signature

Information regarding Section 3 Business Concerns can be found at 24 CFR 75.5

FOR ADMINISTRATIVE USE ONLY

Is the business a Section 3 business concern based upon their certification?

☐**YES** ☐**NO**

EMPLOYERS MUST RETAIN THIS FORM IN THEIR SECTION 3 COMPLIANCE FILE FOR FIVE YEARS.

Section 3 Income Limits

Eligibility Guidelines

The worker's income must be at or below the amount provided below for an individual (household of 1) regardless of actual household size.

Individual Income Limits for Augusta-Richmond County, GA
FY 2022

Income Limits Category	FY 2022 Income Limits
Extremely Low Income Limits (30%)	$15,600
Very Low Income Limits (50%)	$25,950
Low Income Limits (80%)	$41,550

See https://www.huduser.gov/portal/datasets/il.html for most recent income limits.

Section 3 Worker Definition:

- A low or very low-income resident (the worker's income for the previous or annualized calendar year is below the income limit established by HUD); or
- Employed by a Section 3 business concern; or
- A YouthBuild participant.

Targeted Section 3 Worker Definition:

- Employed by a Section 3 business concern or
- Currently meets or when hired met at least one of the following categories as documented within the past five years:
- A resident of public housing; or
- A resident of other public housing projects or Section 8-assisted housing; or
- A YouthBuild participant.

Section 3 Worker and Targeted Section 3 Worker Self-Certification

The purpose of HUD's Section 3 program is to provide employment, training and contracting opportunities to low-income individuals, particularly those who are recipients of government assistance for housing or other public assistance programs. **Your response is voluntary, confidential, and has no effect on your employment.**

Eligibility for Section 3 Worker or Targeted Section 3 Worker Status

A Section 3 worker seeking certification shall self-certify and submit this form to the recipient contractor or subcontractor, that the person is a Section 3 worker or Targeted Section 3 Worker as defined in 24 CFR Part 75.

Instructions: Enter/select the appropriate information to confirm your Section 3 worker or Targeted Section 3 Worker status.

Employee Name:

1. Are you a resident of public housing or a Housing Choice Voucher Holder (Section 8)? ☐YES ☐NO
2. Are you a resident of the Augusta/Richmond County? ☐YES ☐NO
3. In the field below, select the amount of individual income you believe you earn on an annual basis. *The grantee should confirm that their state and local laws do not prohibit this question.

☐ Less than $10,000 ☐ $30,001 - $40,000 ☐ More than $60,000 ☐ $10,001 - $20,000
☐ $40,001 - $50,000 ☐ $20,001 - $30,000 ☐ $50,001 - $60,000

Select from *ONE* of the following two options below:

I qualify as a:

☐ Section 3 Worker (as defined on page 4 of Section 3 Worker Certification Form)

☐ Targeted Section 3 Worker (as defined on pages 4-5 of Section 3 Worker Certification Form)

Employee Affirmation

I affirm that the above statements are true, complete, and correct to the best of my knowledge and belief. I hereby certify, under penalty of law, that the following information is correct to the best of my knowledge.

Employee Address: _____

Print Name: _____ Date Hired: _____

Signature: _____ Date: _____

FOR ADMINISTRATIVE USE ONLY

Is the employee a Section 3 worker based upon their self-certification? ☐**YES** ☐**NO**

Is the employee a Targeted Section 3 worker based upon their self-certification? ☐**YES** ☐**NO**

Was this an applicant who was hired as a result of the Section 3 project? ☐**YES** ☐**NO**

If Yes, what is the name of the company? _____

What was the date of hire? _____

EMPLOYERS MUST RETAIN THIS FORM IN THEIR SECTION 3 COMPLIANCE FILE FOR FIVE YEARS.

The Housing Authority of The City of Augusta, GA
Section 3 Income Limits

Eligibility Guidelines

The worker's income must be at or below the amount provided below for an individual (household of 1) regardless of actual household size.

Individual Income Limits for Augusta-Richmond County, GA

FY 2022

Income Limits Category	FY 2022 Income Limits
Extremely Low Income Limits (30%)	$15,600
Very Low Income Limits (50%)	$25,950
Low Income Limits (80%)	$41,550

See https://www.huduser.gov/portal/datasets/il.html for most recent income limits.

Section 3 Worker Definition:

- A low or very low-income resident (the worker's income for the previous or annualized calendar year is below the income limit established by HUD); or
- Employed by a Section 3 business concern; or
- A YouthBuild participant.

Targeted Section 3 Worker Definition (for public housing)

- Employed by a Section 3 business concern or
- Currently meets or when hired met at least one of the following categories as documented within the past five years:
- A resident of public housing; or
- A resident of other public housing projects or Section 8-assisted housing; or
- A YouthBuild participant.

SECTION 3 BUSINESS UTILIZATION PLAN

Company Contact Information

Company Name	
Street Address	
City, ST, ZIP Code	
Contact Name	
Phone	
E-Mail Address	
Project Name	

Instructions

Complete this form and return to The Augusta Housing Authority before signing the construction contract.

Executive Director
1435 Walton Way
Augusta, GA 30901

To receive Section 3 preference on a bid award, businesses must submit a Section 3 Utilization Plan. Section 3 Utilization Plans must be submitted individually with each project awarded. The Utilization Plan must be approved before a contract will be signed. The Augusta Housing Authority will not move forward with funding of any Section 3 preference awards until the Section 3 Utilization plan and Section 3 Application are approved. The Section 3 Utilization plan will be bound in the contract. All subcontractors underneath the general contractor with contracts $100,000 or more must likewise comply with the Section 3 Utilization Plan.

Subcontractors Working on this Job

Name & address of subcontractors for this bid		Are they Section 3?	Qualifying Condition	Total Contract Award
1				
2				
3				
4				
5				
6				

Current Workforce Information

Detail the company's current workforce information.

Number of Current Employees & job functions:	
How many employees will work on this project? What are their job functions?	
Are you going to hire additional employees? For which positions?	
Are you going to subcontract any work? Explain	
Do the owners work on-site? In what capacity?	
Do you have an office staff? How many people?	
Other pertinent information:	

Section 3 Hiring Plan

How do you plan to incorporate Section 3 criteria into this project? Please include information on hiring, outreach, training, & other activities to incorporate Section 3 Residents. Attach additional pages if needed.

Engaging Section 3 Businesses

As applicable to this project please detail how you will engage other Section 3 Businesses. This includes subcontracting, training partnerships, etc. Please attach additional pages as necessary.

_____

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Affidavit of Commitment

By signing below our company gives firm commitment to include in all bids the Section 3 Plan (once approved by The Augusta Housing Authority) which identifies activities to comply with the Section 3 program and The Augusta Housing Authority Section 3 clause. Our company also gives firm commitment to conduct aggressive outreach and notification to potential Section 3 residents and businesses for hiring opportunities. Our company gives firm commitment to inform area employment agencies of jobs available from the established job pool of Section 3 area residents. Our company commits to implement the Utilization Plan proposed in this document as well as any additional The Augusta Housing Authority requirements to the fullest extent possible. If awarded the project this Utilization Plan becomes part of our contract with The Augusta Housing Authority for this project. It is our responsibility to follow, document and prove that the company has implemented the Utilization Plan. Any direct violation of this Utilization Plan may result in corrective actions and/or termination of the contract.

_____

Printed Name and Title of Certifying Officer in the Company

_____

Name of the Company

_____

Certifying Officer Signature

_____

Date

Special Conditions
Section 3 Requirements, 24 CFR Part 75

Section 3 of the HUD Act of 1968, as amended in 1994 applies to direct financial assistance awarded, provided, or otherwise made available under any program administered by HUD, in the form of loans, grants, cooperative agreements, subsidies, contributions, or other types of financial assistance provided in aid of housing, urban planning, development, redevelopment, or renewal, public or community facilities, and new community development. Refer to Clause 40 of the General Conditions of the Contract for Construction, Public and Indian Housing Programs, form HUD-5370 or Clause 13 in form HUD-5370-EZ dated November 1992.

Section 3 Worker:

- A low or very low-income resident (the worker's income for the previous or annualized calendar year is below the income limit established by HUD); or
- Employed by a Section 3 business concern: or
- A Youth Build participant.

Section 3 Targeted Worker:

- Employed by a Section 3 business concern or
- Currently meets or when hired met at least one of the following categories as documented within the past 5 years:
  - A resident of public housing; or
  - A resident of other public housing projects or Section 8-assisted housing; or
  - A Youth Build participant.

Section 3 Business Concern:

- At least 51 percent of the business is owned and controlled by low- or very low-income persons
- At least 51 percent of the business is owned and controlled by current public housing residents or residents who currently live in Section 8-assisted housing.
- Over 75 percent of the labor hours performed for the business over the prior three-month period are performed by Section 3 workers

Points of Contact:

- The University of Georgia
  Small Business Development Center
  2907 Professional Pkwy, Suite B
  Augusta, Georgia 30907
  Phone (706) 650-5655
  FAX (706) 650-5660
  Email: augusta@georgiasbdc.org

Continued

Special Conditions
Section 3 Requirements, 24 CFR Part 75

- Georgia Department of Labor
  Career Service Center
  601 Greene Street
  Augusta, Georgia 30901
  Phone (706) 721-3131
  FAX (706) 721-7680

- Richmond/Burke Job Training Authority, Inc.
  209 Seventh Street
  Augusta, Georgia 30901
  Phone (706) 721-1858

To the greatest extent possible where there is a training program, Section 3 area residents receiving preference for training. The contractor and subcontractor are obligated under part 75 Subpart B of the regulations to the maximum number of persons in training categories and to fill all vacant training positions which remain unfilled after a good faith effort has been made to fill them with eligible/qualified Section 3 area residents.

Failure or refusal to comply and give satisfactory assurances of future compliance with the requirements of the Section 3 Clause shall be proper basis for applying sanctions. Any or all of the following sanctions may be taken, as appropriate: cancellation, termination, or suspension in whole or in part of the contract; a determination of ineligibility or debarment from any further contracts with respect to which the failure or refusal occurred until satisfactory evidence has been received, and referral to the Department of Justice for appropriate legal action.

EMPLOYEE RIGHTS

UNDER THE DAVIS-BACON ACT

FOR LABORERS AND MECHANICS EMPLOYED ON FEDERAL OR FEDERALLY ASSISTED CONSTRUCTION PROJECTS

PREVAILING WAGES

You must be paid not less than the wage rate listed in the Davis-Bacon Wage Decision posted with this Notice for the work you perform.

OVERTIME

You must be paid not less than one and one-half times your basic rate of pay for all hours worked over 40 in a work week. There are few exceptions.

ENFORCEMENT

Contract payments can be withheld to ensure workers receive wages and overtime pay due, and liquidated damages may apply if overtime pay requirements are not met. Davis-Bacon contract clauses allow contract termination and debarment of contractors from future federal contracts for up to three years. A contractor who falsifies certified payroll records or induces wage kickbacks may be subject to civil or criminal prosecution, fines and/or imprisonment.

APPRENTICES

Apprentice rates apply only to apprentices properly registered under approved Federal or State apprenticeship programs.

PROPER PAY

If you do not receive proper pay, or require further information on the applicable wages, contact the Contracting Officer listed below:

Executive Director
Housing Authority of the City of Augusta
1435 Walton Way
Augusta, GA 30914

or contact the U.S. Department of Labor's Wage and Hour Division.

WAGE AND HOUR DIVISION
UNITED STATES DEPARTMENT OF LABOR

1-866-487-9243
TTY: 1-877-889-5627
www.dol.gov/whd

WH1321 REV 10/17

DERECHOS DEL EMPLEADO
BAJO LA LEY DAVIS-BACON

PARA OBREROS Y MECÁNICOS EMPLEADOS EN PROYECTOS DE CONSTRUCCIÓN FEDERAL O CON ASISTENCIA FEDERAL

SALARIOS PREVALECIENTES

No se le puede pagar menos de la tasa de pago indicada en la Decisión de Salarios Davis-Bacon fijada con este Aviso para el trabajo que Ud. desempeña.

SOBRETIEMPO

Se le ha de pagar no menos de tiempo y medio de su tasa básica de pago por todas las horas trabajadas en exceso de 40 en una semana laboral. Existen pocas excepciones.

CUMPLIMIENTO

Se pueden retener pagos por contratos para asegurarse que los obreros reciban los salarios y el pago de sobretiempo debidos, y se podría aplicar daños y perjuicios si no se cumple con las exigencias del pago de sobretiempo. Las cláusulas contractuales de Davis-Bacon permiten la terminación y exclusión de contratistas para efectuar futuros contratos federales hasta tres años. El contratista que falsifique los registros certificados de las nóminas de pago o induzca devoluciones de salarios puede ser sujeto a procesamiento civil o criminal, multas y/o encarcelamiento.

APRENDICES

Las tasas de aprendices sólo se aplican a aprendices correctamente inscritos bajo programas federales o estatales aprobados.

PAGO APROPIADO

Si Ud. no recibe el pago apropiado, o precisa de información adicional sobre los salarios aplicables, póngase en contacto con el Contratista Oficial que aparece abajo:

Director Ejecutivo

Housing Authority of the City of Augusta

1435 Walton Way

Augusta, GA 30914

o póngase en contacto con la División de Horas y Salarios del Departamento de Trabajo de los EE.UU.

DIVISIÓN DE HORAS Y SALARIOS
DEPARTAMENTO DE TRABAJO DE LOS EE.UU.

1-866-487-9243
TTY: 1-877-889-5627
www.dol.gov/whd

WH1321 SPA REV 10/17

"General Decision Number: GA20220311 09/16/2022

Superseded General Decision Number: GA20210311

State: Georgia

Construction Type: Building
BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories)

County: Richmond County in Georgia.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2022.
If the contract was awarded on	. Executive Order 13658

or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	generally applies to the contract. . The contractor must pay all covered workers at least $11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	07/22/2022
1	09/09/2022
2	09/16/2022

ASBE0048-003 04/05/2022

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR	$ 29.67	17.26

ELEC1579-004 10/01/2021

	Rates	Fringes
ELECTRICIAN	$ 27.45	15.28

ENGI0474-005 07/01/2020

	Rates	Fringes
POWER EQUIPMENT OPERATOR: Backhoe/ Excavator/ Trackhoe	$ 30.00	15.68

ENGI0926-005 07/01/2022

	Rates	Fringes
POWER EQUIPMENT OPERATOR: Crane	$ 34.66	13.83

ENGI0926-006 07/01/2020

	Rates	Fringes
POWER EQUIPMENT OPERATOR: Forklift	$ 33.18	13.83

IRON0387-002 01/01/2022

	Rates	Fringes
IRONWORKER, ORNAMENTAL	$ 28.64	13.92
IRONWORKER, STRUCTURAL	$ 28.64	13.92

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* PLUM0072-006 08/01/2022

	Rates	Fringes
PIPEFITTER	$ 35.08	15.81

SHEE0085-023 07/01/2020

	Rates	Fringes
SHEET METAL WORKER	$ 34.58	15.24

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* UAVG-GA-0001 04/15/2021

	Rates		Fringes
IRONWORKER, REINFORCING	$ 27.92		15.60

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* SUGA2017-026 04/15/2021

	Rates		Fringes
CARPENTER	$ 24.83		0.00
CEMENT MASON/CONCRETE FINISHER	$ 22.92		0.00
LABORER: Common or General	$ 13.29	**	0.00
LABORER: Pipelayer	$ 12.55	**	1.90
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 14.88	**	0.00
OPERATOR: Bulldozer	$ 15.23		0.00
OPERATOR: Grader/Blade	$ 16.80		0.00
OPERATOR: Loader	$ 14.86	**	0.00
OPERATOR: Roller	$ 14.05	**	0.00
PAINTER (Brush and Roller)	$ 16.14		0.00
PAINTER: Spray	$ 16.29		0.00
PLUMBER	$ 28.28		2.41

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($15.00) or 13658 ($11.25). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate

(weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal

process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

SAFETY SPECIAL NOTICE

TO BE USED WITH OCCUPIED BUILDING

While work is being performed, this building and/or neighboring buildings is occupied and is a residence of the Augusta Housing Authority.

Contractor will stage his work schedule so as to maintain the security of the site at all times during the construction. Contractor will erect temporary barriers and protection to prevent unauthorized access to construction areas as well as protect residents, visitors, and staff from debris and hazards.

Work will be scheduled so as to minimize interruptions to residents and provide notice prior to performing work that will require limited access. Ensure areas accessible by residents, visitors, and staff are free of hazards at the end of each work day.

Minimum Accepted Standards & Materials

NOTE: The following is a list of minimum quality standards and materials used in Augusta Housing Authority contracts. **Contractor is advised to verify project site conditions and quantities prior to submitting bid.**

SAFETY

The government considers the Prime Contractor to be the "controlling authority" for all worksite safety and the health of each subcontractor(s). Contractors are responsible for informing their employees and subcontractors of the safety provisions, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out.

DEMOLITION

Perform demolition in such a manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Provide safeguards, including warning signs, barricades, temporary fences, warning lights and/or other similar items that are required for protection of all personnel during demolition and removal operations. Dumpsters shall be placed to minimize disruption of vehicular and pedestrian traffic flow and shall be removed as soon as possible. Dumpster location to be approved by Housing Authority Representative prior to dumpster delivery. Plywood shall be placed beneath the dumpster contact points to minimize damage to asphalt, concrete or landscaping. A tarp shall cover the dumpster opening at all times work is not in progress.

CONCRETE

Concrete minimum: 3000 psi with minimum rust on the rebar or metal mesh. Excessive rust shall be removed with a wire brush or similar means prior to placement. Rebar will be included in all concrete unless altered by specifications. Compact subbase to a minimum 95% maximum density. Schedule inspection of compacted subbase, concrete forms and rebar with Housing Authority Representatives prior to pour.

MASONRY

All masonry units shall be delivered free of defects or damage. Store above grade, protected from contamination or damage. Verify correct sizes, shapes, colors and materials upon delivery. Anchors, ties and reinforcement shall be per the drawings and per the manufacturer's installation instructions.

Wall ties minimum: Galvanized 14 gauge 1-1/2" wide with a minimum 2" embedment into bed joint; spaced 24" vertically and horizontally.

CMU wall reinforcing minimum: 3/16" x 8" nom. trussed wire design every two courses after bed joint.

MISC. METALS

Metals exposed to the elements shall be non-ferrous, coated, hot-dip galvanized or stainless steel.

LUMBER

General: #2 S.Y. Pine (Pressure Treated if in contact with concrete)
Truss members: Engineered Butt Top Chord to be fire resistant wood #2 Southern Yellow Pine.
Wall and Roof Sheathing: 3/4" APA Rated Exterior Plywood with clips on roof.
All other exterior plywood: 5/8" APA Rated Exterior Plywood.
Exterior Trim –Fascia etc.: Fir, trim and siding grade, finger joint acceptable.
For interior shelves: APA C-C ¾" except for closets shall be A-B. Start 1" off interior face of door frame except for top shelf in pantry or linen closets which will be 6" off interior face of door frame.
Interior Finish and Trim – White Pine, C or better Fir.
Wood Base: 9/16" X 3 -1/4" Grade A white pine. Shoe mold: ½" x ¾".
Chair and Window head: ¾" X 3 ½" Red Oak clear stain grade.

WINDOWSILLS

1" x 4" solid yellow pine, painted.

PAINT

Unless otherwise specified, paint to be obtained from AHA Facilities or Maintenance with any materials drawn from AHA deducted from contract.
Generally: Paint materials are to conform to the restrictions of the local Environmental and Toxic Control jurisdiction. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by the Secretary of Housing and Urban Development. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in HUD - Code of Federal Regulations, Subpart F, Title 24.

CABINETRY – No Particle Board

Cabinet: 3/4" plywood cabinet with ¾" plywood doors natural birch, plain sawn.
Countertop: Use softwood plywood 5/8" minimum.
Laminate: Butcher block unless otherwise noted – 0/050 min thickness grade GP-50.

INSULATION

Attic: min R-38; Walls: min R-11. All class C siding shall be installed over Styrofoam insulation formed to match pattern of covering.

ROOFING

Shingles: 12"x 36" with 5" exposure, 3 tab, 30-year class A (Materials will match existing and Contractor will get approval of samples prior to starting roof replacement).
Underlayment: 15# saturated felt.
Sheathing: Not less than ¾" plywood, use panels rated as "Exposure 1" or better with clips. DO NOT USE OSB.
Sheathing Layout: Install sheathing panels with long dimension perpendicular to rafters and according to the recommendations of the Engineered Wood Association (APA). Use panels no smaller than 4 feet long. Blocking of unsupported edges may be required near gables, ridges, and eaves. Unless otherwise indicated by the panel manufacturer, leave a 1/8-inch gap (about the width of a 16d common nail) between panel edges to allow for expansion.

Fasteners: Fasten plywood sheathing to roof rafters with 2.5-inch deck screws or a minimum 8d ring shank nail (2.5 inches long), with full round heads to avoid head pull-through. DO NOT USE STAPLES. Maintain ridge nailing by adding additional blocking set back from the ridge, or by using vent holes drilled along the ridge. Vent holes shall not remove more than 50% of plywood area along ridge.
Fastener Spacing: Fasteners shall be spaced a max. of 6" apart at corners, edges and ridges and a max. of 12" apart, both ways, in the panel field.

Rake and Eave drip: TPO clad drip edge metal 2" x 4" x 10' (4" top, 2" face with 1/2" kick out drip edge. 24-gauge galvanized steel. TPO clad on one side for welding
Color: White unless otherwise indicated.
Flashing: 24 gauge G.I. at all roof penetrations. Placement of flashing, counter-flashing and sealants shall be inspected and approved prior to being covered.
Ridge Vents will run continuously the full length of the ridge of the roof stopping at an equal distance approx. 12" from either end of the attic space. Unless otherwise noted ridge vent will be a minimum of 12 gauge and 1/8" thick for angles, channels, etc. No less than 12 sq. inches per lineal foot net free air area.

ALUMINUM FASCIA –VINYL SOFFIT, SIDING AND SHUTTERS

20-year warranty minimum.
Vinyl Siding: Wood Grain Texture -.044" thick – horizontal pattern – 10-inch exposure in double 5-inch style with 1" thick and 5.0 R-value rigid styrofoam insulation similar to Dow Chemical Blue Styrofoam Brand (XPS) Type X. (Submittal required).
Soffit: 6" exposure in triple 2" beaded edge -0.44 thick with F and J Channels.
Shutters: 15-inch-wide PVC each side of all front windows – full height of window.
Aluminum fascia: Form fit fascia and wood to corner – 0.032' thick – 3coat PVC fluoride finish.
Frieze-board and all exterior wood are to be covered with either vinyl or aluminum fascia material.

DOORS

Match existing.
Exterior: 1-3/4" flush solid core metal security exterior door w/ peephole. 4 ½" exterior hinges.
Security Screen Door: 1-1/4" Aluminum .050 "Z" Bar Security Screen.
Interior: 1-3/4" flush solid core– paint grade. 3 ½" interior hinges (20-gauge steel)
Hardware: Door handles shall be lever handle style equal to "NSP" Commercial Grade with 1 ¾" back-set.
Attic Access: Pull downstairs or wood scuttle cover. Minimum 24" by 54" with hasp. Master style lock supplied by owner.

VINYL WINDOWS AND SECURITY SCREENS

Windows will be double glazed and similar in appearance to existing and will meet or exceed those comparable to Ply Gen 1500. Color to match existing. Security Screens will be top hinged extruded to meet or exceed those comparable to those manufactured by Olney or equal to 6063-

T5 Aluminum w 12x12x 0.023 powder coated piano hinges. Submittals must be approved prior to order.

FLOORING

12" X 12" X 1/8" VCT tile (unless otherwise noted) with through color. Alternate tiles at right angles to each other (equal to AHA stock).

HVAC - Check existing equipment and meet or exceed existing system.

Properly sized Rheem Heat Pump (or equal quality) – Double pan with ¾" drain lines on each pan with auto float cut-off switch. Exterior condenser unit shall have a protective condenser guard installed and securely anchored to the HVAC pad with non-reversible screws or fasteners. The condenser guard shall be comparable to models by Rheem, Trane or approved equivalent. The cover shall be sized to provide a minimum of 4" clearance above and on all sides of the unit.

PLUMBING unless otherwise identified

PEX System: Blue lines- cold water, Red lines- hot water. Support either with clips no more than 30" apart.
Steel pipes: Support ¾" or smaller every 6'. ¾" -1-1/2" every 8', 2"-2-1/2" or larger every 10'.
PVC Pipe: Supported every 48".
Waste Line: Schedule 40 PVC 4" typ. Washing machine box: 2" drain line.
Pipe insulation: Cold water lines – ½"; Hot water lines – 1"; Any through slab - ¾".
Piping within 1-1/2" of sheetrock at studs or plates gets a 1-1/2" x4" steel protector plate.

ELECTRICAL

Electrical fixtures (lighting) to be obtained from AHA Facilities or Maintenance with any materials drawn from AHA deducted from contract.
All electrical must be installed by licensed professionals and will meet all NEC requirements. No branch circuit wiring other than copper, no gauge smaller than #12 except for control wiring.
Aluminum SE Cable is acceptable from the Meter Base to the Service Panel Main Lugs. Use N0-Ox on the connections.
Electrical Contractor provides all wiring above 50 volts.
Mechanical Contractor provides all wiring below 50 volts.
Power meter base 200 AMP as supplied by GA Power (with cut off at meter).
Main Service Panel to be minimum 200 MLO.
All wring #8 Gauge or larger to be stranded, all #10 Gauge or smaller to be solid type,
THNN insulated. Ground rods to be ¾" x 10' copper clad chemical weld.
Circuit breakers GFCI, ARC- Fault and Regular per NEC CODE in locations.
All boxes get 1-1/2" plaster ring installed flush with wall.
Wiring of service line to meter box to be disconnect. Only the wiring exposed to the elements shall be in conduit. Romex O.K. leaving panel box

DRYWALL

5/8" Type- 'X' on the walls and 1/2" for the ceilings. 5/8" Green board in bathrooms,kitchen and laundry room with Hardie Backer Cement Board behind tub surround and/or under ceramic tile.

BUILD AMERICA BUY AMERICA

*a Provision of the Infrastructure Investment and Jobs Act

The Buy American Act & the Buy America Act

Please note that **Buy America** and **Buy American** have separate **legislation** and regulation requirements.

- **Buy American** requirements apply to direct purchases by the U.S. federal government valued at more than US$10,000. The 1933 Act applies to direct purchases by the federal government, but not third parties, such as private contractors given procurement funding through government endowments.
- **Buy America** requirements apply to purchases of iron, steel and other manufactured products permanently incorporated into infrastructure projects. Further, these projects must be undertaken by U.S. states and municipalities with funds issued by certain U.S. federal departments and agencies. *Buy America generally refers to* the various domestic content restrictions that attach to *Public Works grants* to state and local government entities for the construction of transportation projects.
- **These departments and agencies are**: the U.S. Environmental Protection Agency (EPA), the U.S. Federal Transit Administration (FTA), the U.S. Federal Highway Administration (FHWA), the U.S. Federal Railroad Administration (FRA), Amtrak and the U.S. Federal Aviation Administration (FAA).

What are the main differences between Buy America and Buy American?

The Buy American Act applies when the federal government is directly assisting in the procurement of products, or a federal facility is being constructed. Under this statute, the goods or products are qualified as being domestic when they are **100% manufactured in the United States and with at least 50% domestic content.**

The Buy America Act typically applies only to mass-transit procurements for state and local government projects, such as the construction of highways, railways, or rapid transit systems. The requirements of this statue are regulated by the Federal Transit Administration (FTA) and the Federal Highway administration (FHWA). Under the Buy America Act, end products must be **100% manufactured in the United States and all steel and iron components MUST be mined, melted, and manufactured in the United States**.

To remain in compliance with the Buy America Act, *please complete the following page and return it with your bid or proposal.*

THE HOUSING AUTHORITY

OF THE CITY OF AUGUSTA, GA

BUY AMERICA

CERTIFICATE OF COMPLIANCE

Date _____, 20____

We, _____

(Contractor or Vendor)

Of _____

(Address)

Hereby certify that we are in and will maintain compliance with the "Buy America" requirements of this project to the best of our knowledge and ability.

By _____

Title _____

Signature _____

Subscribed and sworn to before me this _____ day of _____, _____.

_____ My Commission Expires: _____

Notary Public

Special Conditions

1. General Scope:

   The Contractor will include in the bid the cost for all labor, materials, supervision, transportation, storage, taxes, fees, etc. that will be required for The Comprehensive Modernization of Ervin Towers, GA001000072, Augusta, GA 30901. By submitting a bona fide Bid, the Contractor will be certifying that they have fully read, understand, and will comply with all Contract Documents. Specifications and submittal information follow in subsequent sections of this manual.

2. OWNER:

   Wherever the term "PHA", "AHA", "Augusta Housing Authority", or "Housing Authority of the City of Augusta" or any derivation thereof appears in these specifications, it shall mean the

   Housing Authority of the City of Augusta, Georgia
   1435 Walton Way, Augusta, Georgia 30901

   Use of the term Housing Authority Representative will be understood to mean, the Executive Director or any representative he so designates.

3. ARCHITECT:

   For the purpose of this project the terms "Architect", "Engineer", etc. shall be interpreted as the contracting officer or any duly appointed representative. This will not infer any special qualifications, or professional status to the said representative, but is used solely to expedite the completion of the contract. Decisions made by such representative will not represent those of a design professional and the contractor will still be responsible for ensuring that all work is within the acceptable limits of the local ordinances. If at such time it becomes necessary to obtain professional advice or certification the Authority shall seek out a qualified individual.

3. BIDS:

   Bids shall be submitted as specified in the General Conditions and as shown on the Bid Forms. Bid form must list contractor name and initials at the bottom of each page.

4. CHARACTER OF WORKMEN:

The AHA may require the Contractor to remove from the work site such employees as the AHA deems incompetent, careless, insubordinate, or otherwise objectionable, or whose continued employment on the work site is deemed by the AHA to be contrary to the public interest. Additionally, the AHA may request the contractor (or a proposed subcontractor) provide a minimum of five (5) references of similar work over the past two years. If requested the contractor must provide the required references within one week of the request from the AHA. Failure to provide adequate references or providing false or incorrect references may result in the contractor being declared ineligible. The AHA retains the right to determine the contractor's eligibility.

5. COMPLIANCE WITH SECTION 3 OF THE U.S. DEPARTMENT OF HUD ACT OF 1968.

Prior to bidding the contract, the contractor will become acquainted with Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C.1701u (Section 3) (hereinafter referred to as Section 3). Evidence of contact with local agencies, in the form of copies of letters of interest to these agencies, will be transmitted to the Authority within ten (10) days of the notice to proceed.

6. WAIVER OF PERMITS AND FEES:

The Contractor will be required to pay for all permit fees required by the appropriate government agencies for this project. This deals with permits for electrical, water, gas, sewer, plumbing, and construction permits. Permits for unusual conditions or materials will be identified in the specifications and be part of the base bid. The general contractor and any subcontractor must obtain a business license from the appropriate local government agencies at the contractor's expense.

7. LAND FILL FEE:

Dumping fees will be charged for this project and will be paid by the contractor. The Richmond County Landfill located approximately 35 miles (round trip) from the project site. The contractor will pay all costs for hauling to and from the Richmond County Landfill. Additionally, the contractor will handle disposal of all materials produced on the site.

8. COMMUNICATIONS:

All notices, demands, requests, instructions, approvals, proposals, and claims must be in writing. Any notice to or demand upon the Contractor shall be sufficiently given if delivered at the office of the Contractor stated on the signature pages of the Contract, or at such other location stated on the signature pages of the Contract or at such other office as he may from time to time designate in writing to the AHA,

by depositing in the United States Mail in a sealed, postage prepaid envelope, or if delivered with charges prepaid to any telegraph company for transmission, in each case addressed to such office.

All papers required to be delivered to the AHA or Architect shall, unless otherwise specified in writing to the Contractor, be delivered to the Housing Authority of the City of Augusta, Georgia, at The J. Madden Reid Administration Building, 1435 Walton Way and any notice to or demand upon the AHA or Architect shall be sufficiently given if so delivered, or deposited in the United States mail in a sealed, postage prepaid envelope, to said Housing Authority of the City of Augusta, Georgia, J. Madden Reid Administration Building, 1435 Walton Way, Augusta, Georgia 30901, or to such other representatives of the AHA or to such other address as the AHA may subsequently specify in writing to the Contractor for such purpose

Any such notice shall be deemed to have been given as of the time of actual delivery; or, in the case of mailing, when the same should have been received in due course of post; or, in the case of telegrams, at the time of actual receipt.

9. CONTRACTOR USE OF PREMISES:

Limit use of the premises to construction activities in areas indicated; allow for Owner Occupancy and use by the public.

Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.

Keep driveways and entrances clear at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize requirements for storage of materials.

Pursuant to 24 CFR Parts 965 and 966, the AHA has adopted the following policy: The use of prohibited tobacco products by residents and Augusta Housing Authority (AHA) staff is prohibited in all public housing living units and interior areas (including but not limited to hallways, porches, balconies, elevators, rental and administrative offices, maintenance facilities, shops, laundry rooms, warehouses, and similar structures), as well as in outdoor areas within 25 feet from public housing, administrative and maintenance office buildings and agency vehicles.

Prohibited tobacco products are defined as items that involve the ignition and burning of tobacco leaves, such as (but not limited to) cigarettes, cigars, pipes, Electronic Nicotine Delivery System (ENDS) and waterpipes (hookahs).

10. USE OF EXISTING BUILDINGS:

Maintain the existing buildings in a secure and weather tight condition throughout construction. Repair damage caused by construction operations. Take precautions

necessary to protect the buildings and occupants during the construction period. This may include erection of temporary enclosures and additional security measures as may be stipulated by conditions.

11. FULL OWNER OCCUPANCY:

The Owner will occupy the site and existing buildings during construction. Cooperate with the Owner to minimize conflicts and facilitate Owner usage. Perform the work so as not to interfere with the Owner's operations.

12. COOPERATION:

The general contractor and all subcontractors shall cooperate with one another and with other contractors doing related work and shall coordinate their work with the work or other trades and other contractors so as to facilitate the general progress of the work. Each trade shall afford all other trades and other contractors every reasonable opportunity to perform their work and for the storage of their materials.

13. MANNER OF PERFORMING WORK:

The work shall be organized and arranged in such a manner and method so as to cause the minimum of interference with the conduct of the Authority's operations. Rights of residents, in surrounding dwelling units where work is being done, shall be respected. Workmen shall be restricted from all buildings other than those at which work is being done.

Before any of the contract work is begun, the Contractor shall confer with the AHA and make arrangements for available trucking space on the project sites for delivery of the materials, equipment, etc., and storage of same, means of access to the premises and buildings. If no space is available for storage of materials, equipment, etc., on the project sites, the Contractor shall make arrangements for storage of same elsewhere. Parking and storage areas for Contractors shall be designated by the AHA. The area shall be left clean and restored to the same condition as when accepted by the Contractor.

Present trucking areas, streets, walks and parking areas shall not be obstructed, but shall remain free and open to vehicular and pedestrian traffic at all times.
The Contractor will schedule to work so that the job is completed within the length of time set in the Contract Documents. If the Contractor is absent from the job for more than ten (10) consecutive days, without prior notice to the Owner. The Owner may declare the job abandoned and cancel the contract without incurring additional expenses (other than that due for physical work completed to that point).

No materials, equipment, etc., shall be stored on the project site or delivery to same, in such a manner so as to create hazardous conditions to the residents.

The Contractor shall remove all rubbish, debris and usable materials and items from the dwelling units, buildings and premises at the end of each working day. Rubbish, debris, etc., will not be permitted to accumulate in excessive amounts that, in the opinion of the owner, will become hazardous under foot and/or to vehicular traffic. **Trash burning on the project sites will not be permitted.**

The Contractor will provide a schedule of work to ensure completion. This schedule WILL be updated as needed. Failure of the Contractor to comply with the schedule MAY be cause for removal from the Job. Schedule of work WILL BE required prior to the issue of pay request.

14. OVERTIME WORK:

The contract is based on the usual normal working hours (8:00 AM to 5:00 PM local time) Monday through Friday. Saturday or holiday overtime work will be permitted providing arrangements are made with the AHA for access to the buildings and premises. Overtime work shall be at the discretion of the Contractor; however, additional cost to the AHA for overtime work will not be allowed. NO work on Sunday is permitted.

15. MATERIAL STORAGE:

All materials shall be stored at one site as designated by the AHA.

The Contractor shall pay for all costs required to adequately store materials from the environment and from theft or vandalism. Such facilities shall be subject to the approval of the AHA.

Upon completion of the contract work, or as directed by the AHA, the Contractor shall remove all such temporary structures and facilities from the sites and leave the premises in the same conditions as before starting the contract work and satisfactory to the AHA.

16. MEASUREMENTS AND DIMENSIONS:

Before ordering material and doing work which is dependent upon coordination and building conditions the Contractor shall verify all dimensions, elevations, grades, and pitch by taking measurements at the building and shall be responsible for the correctness of same. NO consideration will be given to any claim based on differences between the actual dimensions and those indicated on the drawings and/or specifications.

17. COMPLIANCE WITH LAWS, CODES AND REGULATIONS, ETC.:

Supplementing the referenced provisions of the General Conditions, the successful bidder awarded this contract by signing the contract acknowledges the following:

1. Underground Gas Pipe Law and all amendments.

2. High Voltage Act and all amendments.

3. Occupational Safety and Health Act and all amendments.

4. National Plumbing Code and all revisions.

5. National Electrical Code and all revisions.

6. NFPA 101 Life Safety Code and all revisions

7. Southern Building Codes/International Building Code (as adopted by the State of Georgia) and all revisions.

By signing the contract, the contractor is representing that he is aware of all the provisions of these and other applicable laws. He also acknowledges responsibility for any damage or expense that may result during the execution of the contract. The above list may be altered by the scope of the work and should not be considered as all-inclusive or exclusive of additional laws codes and regulations that may apply.

18. INSPECTIONS:

The AHA or its duly authorized representative shall always have access to the stock of materials and shall be furnished every reasonable facility for ascertaining that the workmanship is in accordance with the requirements and intent of the specifications. Defective work shall be made good, and materials rejected shall be removed from the site.

Under the contract documents the Contractor has assumed the responsibility of furnishing all services, labor, and materials for the entire work in accordance with such documents. No provisions of this Article or any inspection of the work by the Owner, representatives of the Owner, engineers employed by the Architect, representatives of the Architect or the Architect shall in any way affect said responsibility and undertaking of the Contract; nor shall the failure of any of the foregoing to discover or bring to the attention of the Contractor the existence of any work or materials not in accordance with said contract documents in any way affect such obligations of the Contractor or the rights and remedies of the Owner as set forth in said contract documents.

19. UTILITIES:

The supply of utilities is the responsibility of the Contractor. The contractor is not allowed to plug into resident's outlets and must utilize generators, etc. for their power requirements. Regardless of services used during the construction phase, the

finished unit will be in a condition that would allow immediate occupancy. All service runs, meters, and connections will be made by the contractor or at his expense. After acceptance by the AHA the contractor will cancel his responsibility for services.

20. EQUAL PRODUCTS:

References in these specifications or on the drawings to any article, device, product, material, etc., by name, brand, make or catalog number shall be interpreted as establishing a standard or quality and not to limit competition. Requests for a similar product to be considered an “or equal” should be made in writing to the owner. Such documents should be provided that will establish that the substituted product is equal or superior to the specified product. The final decision for the acceptance or rejection of an "or equal" product will be the Owner.

21. OPTIONS:

Where specifications or drawings permit the use of alternate constructions at the option of the Contractor, the requirement of workmanship, fabrication, and installation as specified or shown for prime material or construction apply so far as practicable to the optional construction except as otherwise provided in the specifications. The Contractor shall submit alternate construction methods to AHA before proceeding with the work. Failure of the contractor to properly notify owner of alternate methods will relieve the owner of any financial obligation for additional cost.

22. SINGULAR NUMBERS:

Where any space, device, material , part of equipment, fixture and item is referred to in singular number or a note shown on one drawing only, such space, device, material, part of equipment, fixture, item, and note shall be deemed to apply to as many such spaces, devices, materials, equipment, fixtures, items and drawings as required to complete the installation and contract work satisfactory to the AHA.

23. INTERRUPTION OF SERVICE:

While work is in progress, except for designated short intervals during which connections are to be made, continuity of service shall be maintained at all times. Interruptions shall be coordinated with the Owner as to time and duration. The Contractor shall be responsible for any interruptions to service and shall repair any damages to existing systems caused by operations.

24. MINOR ADJUSTMENTS:

Contractor will be permitted to make minor adjustments in the measurements shown on the drawings that cover new work, so that all revised and new work will

properly fit, join, unite, and connect onto the present work, all in an acceptable and satisfactory manner. Minor adjustment in the measurements shall not change the design, general arrangements, or the fabrication of the work.

25. REFERENCED STANDARDS:

All references to codes, standards, instructions, technical society, associations, government specifications, etc., shall be understood to mean the current edition, amendments or revisions of the same.

26. CONSTRUCTION REQUIREMENTS:

Construction criteria applicable to this project are specifically outlined in the following publications, which are on available on-line thru the HUD website:

Public Housing Comprehensive Improvements Assistance Program, Handbook 7485.1

Public Housing Modernization Standards, Handbook 7485.2

Manual of Acceptable Practices, Handbook 4930.1

Public Housing Development, Handbook 7417.1

Uniform Federal Accessibility Standards (FED STD 795, April 1, 1988).

27. PROTECTION OF EXISTING STRUCTURES, TREES AND SHRUBS:

The Contractor shall erect and maintain temporary protection around existing structures, particularly windows, and trees and shrubs subject to damage during the process of the work. The Contractor shall be responsible for the replacement or repair of any part of the buildings or property damaged by him during the course of the work.

28. BARRICADES:

The Contractor shall furnish, erect, paint and maintain all sufficient lights and reflectors, all barricades necessary for blocking off any excavation, walk, or street, or portion of walk or street, necessary for the project construction and for the protection of vehicular and pedestrian traffic.

29. EXISTING IMPROVEMENTS:

The Contractor shall maintain in operating condition and protect from damage all existing improvements including utilities, sewers, gutters, and other drains encountered, and repair to the satisfaction of the Owner any surface or subsurface

improvement damaged during the work. The Contractor shall also make reasonable and satisfactory provisions for the maintenance of highway and street traffic.

30. RESTORATION OF PROPERTY:

The Contractor shall carefully restore to original condition all property defaced by operations or acts of any of his agents or employees. Such restoration shall include the repair or replacement of driveways, walks, plantings or other facilities.

31. CLEANING:

Upon completion of the contract work or any other part, the Contractor shall prepare and leave the premises, units and buildings in clean and acceptable conditions satisfactory to the AHA.

32. CORRECTION OF WORK AFTER FINAL PAYMENT:

Neither the final Certificate and Release nor payment nor any provision in the contract documents shall relieve the Contractor of responsibility for faulty workmanship or faulty materials, and he shall remedy any defects due thereto and pay for any damage to other work resulting therefrom. The Owner shall give notice of observed defects with reasonable promptness. The Contractor shall promptly correct, remedy, or remove from the premises all work condemned by the Architect as failing to conform to the contract or as being faulty in materials or workmanship, and the Contractor shall promptly replace and re-execute the work in accordance with the contract and without expense to the Owner. The Contractor shall give prompt notice to the Architect, with copy to the Owner, upon completion of the correction of any work or materials condemned by the Architect as not being in accordance with this contract. In the absence of said notice, it shall be and is presumed conclusively under this contract that there has been no correction of the condemned work or materials. If the Contractor does not remove, correct, or remedy faulty work, including any work called for by the contract documents but omitted, within a reasonable time, fixed by a written notice of the Owner, the Owner may remove the work, correct the work, or remedy the work at the expense of the Contractor. Correction of defective work executed under the plans and specifications, whether covered by warranty of a sub-contractor or materialman or by separate bond of any sub-contractor or materialman, remains the primary direct responsibility of the Contractor. The foregoing obligations of the Contractor shall remain in effect until the same shall have been extinguished by operation of the Statute of Limitations for the jurisdiction which the work is executed. As additional security for the fulfillment of such obligations, but in no way limiting it, the Contractor shall furnish to the Owner a Notarized Certificate and Release (included in the Specification package) for use in connection with the Performance Bonds a warranty and guarantee of the Contractor that all work executed under the plans and the specifications will be free from defects of materials and workmanship for a period of no less than one (1) year from the date of final acceptance. In the case of

work performed by subcontractors and also whenever specific guaranties, warranties, or bonds are called for in the trade sections of the specifications, the Contractor shall furnish guarantees, warranties, or both for such a period of time as maybe stipulated and in no event for less than one (1) year, on which he himself is obligator and he shall obtain and furnish from the sub-contractors or materialmen warranties, guaranties, or bonds for such a period of time as may be stipulated, and in no event for less than one (1) year, which shall be in such form as to permit direct enforcement by the Owner against the sub-contractor materialmen: provided, however, that in the latter instance the general contractor shall also be named as joint principal with such subcontractor or materialman in any bond, warranty, or guaranty, and the instrument shall state that liability is joint and several. The calling for and the furnishing of specific written warranties, guaranties, or bonds shall in no way limit the obligations of the Contractor set forth herein.

33. NOTICE OF DISPUTES:

The Contractor shall notify the Owner within ten (10) calendar days in writing of any change or discrepancy in conditions or work which may alter the price of the contract or increase the time of completion. Failure to do so shall relive the Owner of any additional expenses related to the completion of the project. The Owner shall act on the dispute within sixty (60) days of receipt of the dispute, and the Owners decision shall be final. If the Owners decision is not satisfactory the Contractor may pursue the resolution in accordance with recognized practices, however this will not allow him justification to exceed the time limits established in the contract.

34. LABOR STANDARDS

This job is covered under the Davis Bacon Wage Rate Standards. The Contractor will review the General Conditions and will abide by all conditions throughout the execution of the contract. Under Davis Bacon Wage Rates, all employees performing work on the site will either be carried on the payroll of the General Contractor or on the Payroll of an Approved Subcontractor. <u>There are no "Independent" Contractors under the Davis Bacon Wage Rates.</u> The General Contractor must submit, for review and approval, documentation as required in the Request for Acceptance of Subcontractors before the subcontractor initiates work on the site. Additionally, the classification of HELPER is eliminated, and Helpers will be paid the wage for the duties they perform.

35. TAX EXEMPT STATUS.

The Housing Authority of the City of Augusta, Georgia is a Tax-Exempt Government entity. This applies to sales taxes on direct purchases of materials by the Housing Authority with vendors or supplies. All successful contractors will be provided a State of Georgia Department of Revenue Sales and Use Tax Certificate

of Exemption Georgia Purchaser or Dealer form (ST-5 (Rev. 05-00) before they begin operations on the site.

36. EVALUATION OF AMOUNTS.

Upon award of the contract, the successful bidder will be required to provide the Authority with a break own of charges for contract management purposes.

37. MINIMUM WAGE RATES

This job is run under Davis Bacon Wage Rates (a copy of the most recent wage rates is included here in). The contractor will consider Federal Prevailing Wage Rates and the changes as identified by Congress in the bidding of the job. Any increases in the Federal Minimum Wage will be adhered to strictly.

SECTION 011000
SUMMARY OF WORK

PART 1 - GENERAL

RELATED DOCUMENTS

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

PROJECT DESCRIPTION

This Project consists of renovations to Ervin Towers located at 1365 Laney Walker Blvd. in Augusta, Georgia. Ervin Towers is a ten-story apartment building that was constructed in 1965, and the Augusta Housing Authority finds it necessary to abate asbestos containing material, replace existing electrical, plumbing and HVAC systems, add a fire suppression system, renovate the First Floor, and renovate as many apartment floors as funding will allow.

The base bid includes renovations to the First Floor of approximately 6,300 s.f., construction of an 11-stop elevator shaft and fresh air chase at the west end of the building, and construction of ten stacked electrical rooms and a fresh air chase at the east end of the building.

Each apartment floors are approximately 8,000 s.f. of renovation and floors 2 through 6 will bid as separate alternates to ensure the project meets budget. One floor above the top renovation floor will be demolished and left as a buffer between occupied floors and renovation operations. Renovations include complete replacement of interior walls and chase walls with cold-formed metal framing and drywall, new doors and windows, new cabinetry, new finishes, new water piping and fixtures, new waste piping, new HVAC units, and new electrical systems.

Upgrades to doors, controls and cab interior finishes of two existing passenger elevators are planned.

A temporary office for the building manager will be located in a vacant apartment on the floor immediately above the highest renovation floor. Tenant mail boxes shall be moved to the temporary manager's office until they can be reinstalled at the first floor. Mail boxes shall face the corridor and a locked room of approximately 6' x 12' shall be provided behind the mail boxes for use by USPS personnel.

Apartment floors above floors to be renovated will remain occupied throughout the renovation process. The Contractor shall minimize disruption of services to the extent possible; however, the owner acknowledges shutdowns to water, sanitary waste and electrical power shall be necessary and frequent. Contractor shall keep the building manager informed as to his anticipated shutdown schedule each day.

Sitework is limited to making new connections to existing utilities.

ASBESTOS REPORT

Alternative Construction & Environmental Solutions, Inc. (ACES) has inspected and test Ervin Towers and found asbestos containing material (ACM). ACES will be responsible for monitoring the abatement process. Please refer to the Specification Section 028213 for abatement requirements. A link for downloading the asbestos report will be available during the bidding period.

CONTRACTOR'S USE OF PREMISES

General: For the entire construction period the Contractor's use of the premises for construction activities shall be limited to the boundaries as shown on the Life Safety Plans and as agreed upon by the Owner and General Contractor prior to construction. Under no circumstances shall any construction take place, materials be stored, or equipment be parked in areas outside the designated boundaries. There shall be no disposing of any material on site, either by burial or by burning.

PROTECTION AND SECURITY

The Contractor shall install and maintain at all times all necessary fencing, temporary construction, protective barriers, etc. to ensure the safety and security of Ervin Towers residents, Augusta Housing Authority employees, and the general public while construction is underway. Fire department access to all parts of the property and all required means of egress shall be maintained for the duration of this construction project.

END OF SECTION

SECTION 012010
ALLOWANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements governing handling and processing allowances.

B. Selected materials and equipment, and in some cases, their installations are shown and specified in the Contract Documents by allowances.

C. Types of allowances required include the following:

1. Lump sum allowances.

1.03 SELECTION AND PURCHASE

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

B. When requested by the Architect, obtain proposals for each allowance for use in making final selections; include recommendations that are relevant to performance of the Work. **When allowance work is to be furnished and/or installed by contractors other than the General Contractor, a minimum of three proposals for each allowance shall be obtained.**

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

1.04 EXECUTION

A. Funds will be drawn from the allowances only by approved Change Order. On notification of which products have been selected and approved, the General Contractor shall execute a purchase agreement with the designated supplier and installer.

B. The contractor shall include in the Base Bid contract sum all allowances named in the contract documents and shall cause the work thus covered to be done by such contractors and for such sums as the architect may direct, the contract sum being adjusted in conformity therewith. The contractor declares that the Base Bid contract sum includes such sums for overhead and profit on account of cash and lump sum allowances as he deems proper. No demand for overhead and profit other that those included in the Base Bid contract sum will be allowed. The contractor shall not be required to employ for any such work persons against whom he has a reasonable objection.

C. Allowance funds will not be used for any work indicated in the Contract Documents to be part of the Base Bid Contract.

D. **When changes in the contract sum (increase or decrease) are based on Allowances, no overhead or profit shall be allowed and allowances are net.**

1.05 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form

specified for Change Orders.

B. Submit invoices or delivery slips to indicate actual quantities of materials delivered to the site for use in fulfillment of each allowance.

1.06 UNUSED MATERIALS

A. Return unused materials to the manufacturer or supplier for credit to the Owner, after installation has been completed and accepted.

B. Where it is not economically feasible to return unused material for credit and when requested by the Architect, prepare unused material for the Owner's storage, and deliver to the Owner's storage space as directed. Otherwise, disposal of excess material is the Contractor's responsibility.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

A. Inspect products covered by an allowance promptly upon delivery for damage or defects.

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

3.02 CLOSEOUT

A. At the closeout of the project and the Contract, funds remaining in any of the cash & lump sum allowances will be credited back to the Owner by an approved Change Order.

3.03 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Materials Testing (soil bearing capacity, concrete strength) for the stipulated sum of $5,000.00.

B. Allowance No. 2: As described in Section 114000 Appliances, and as scheduled in Section 012300 Alternates, include the stipulated sum of $2,000.00 per apartment for the purchase of appliances including 24” range oven, 24” recirculating range hood, refrigerator and disposal. Allowance is to reimburse Owner for purchase of appliances. Allowance is for appliances only and does not include cost of electrical work, plumbing work, or installation.

C. Allowance No. 3: Include the stipulated sum of $3,500 labor and materials to install door signage at the first floor under the base bid.

D. Allowance No. 4: As scheduled in Section 012300 Alternates, include the stipulated sum of $100.00 per apartment for room identification signage. Allowance is for materials only and does not include cost of installation.

END OF SECTION

SECTION 012300
ALTERNATES

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section specifies administrative and procedural requirements for Alternates.

Definition: An Alternate is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in Contract Documents.

Coordination: Coordinate related Work and modify or adjust adjacent Work as necessary to ensure that Work affected by each accepted Alternate is complete and fully integrated into the project. All alternates shall include costs of related coordination, modification or adjustment.

Notification: Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to Alternates.

Schedule: A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the Work described under each Alternate. Include as part of each Alternate, miscellaneous devices, accessory objects and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

BASE BID

Base Bid shall include labor and materials to construct entire project at Floors 1 through 10 as described in the Drawings and Specifications.

SCHEDULE OF ALTERNATES

Alternate No. 1: Deduct from the Base Bid all labor & materials required to renovate apartments, corridors, and utility spaces at Floor 10 per drawings and specifications. Deduct $2,000 per apartment unit for appliances under Section 012100 Allowances. Deduct $100 per door for room identification signage under Section 012100 Allowances. All work associated with new service elevator shall remain in base bid. All work associated with fresh air system, ducts, and chases shall remain in base bid. All work associated with new stacked electrical rooms including conduits and conductors shall remain in base bid. All work associated with improvements to existing passenger elevators under Spec Section 142123.16 shall remain in base bid.

Alternate No. 2: Deduct from the Base Bid all labor & materials required to renovate apartments, corridors, laundry room, and utility spaces at Floor 9 per drawings and specifications. Deduct all labor &

materials required to demolish apartment Floor 10 per the drawings and spec section 024119 - Selective Demolition. Deduct $2,000 per apartment unit for appliances under Section 012100 Allowances. Deduct $100 per door for room identification signage under Section 012100 Allowances. All work associated with new service elevator shall remain in base bid. All work associated with fresh air system, ducts, and chases shall remain in base bid. All work associated with new stacked electrical rooms including conduits and conductors shall remain in base bid. All work associated with improvements to existing passenger elevators under Spec Section 142123.16 shall remain in base bid.

Alternate No. 3: Deduct from the Base Bid all labor & materials required to renovate apartments, corridors, and utility spaces at Floor 8 per drawings and specifications. Deduct all labor & materials required to demolish apartment Floor 9 per the drawings and spec section 024119 - Selective Demolition. Deduct $2,000 per apartment unit for appliances under Section 012100 Allowances. Deduct $100 per door for room identification signage under Section 012100 Allowances. All work associated with new service elevator shall remain in base bid. All work associated with fresh air system, ducts, and chases shall remain in base bid. All work associated with new stacked electrical rooms including conduits and conductors shall remain in base bid. All work associated with improvements to existing passenger elevators under Spec Section 142123.16 shall remain in base bid.

Alternate No. 4: Deduct from the Base Bid all labor & materials required to renovate apartments, corridors, and utility spaces at Floor 7 per drawings and specifications. Deduct all labor & materials required to demolish apartment Floor 8 per the drawings and spec section 024119 - Selective Demolition. Deduct $2,000 per apartment unit for appliances under Section 012100 Allowances. Deduct $100 per door for room identification signage under Section 012100 Allowances. All work associated with new service elevator shall remain in base bid. All work associated with fresh air system, ducts, and chases shall remain in base bid. All work associated with new stacked electrical rooms including conduits and conductors shall remain in base bid. All work associated with improvements to existing passenger elevators under Spec Section 142123.16 shall remain in base bid.

Alternate No. 5: Deduct from the Base Bid all labor & materials required to renovate apartments, corridors, laundry room, and utility spaces at Floor 6 per drawings and specifications. Deduct all labor & materials required to demolish apartment Floor 7 per the drawings and spec section 024119 - Selective Demolition. Deduct $2,000 per apartment unit for appliances under Section 012100 Allowances. Deduct $100 per door for room identification signage under Section 012100 Allowances. All work associated with new service elevator shall remain in base bid. All work associated with fresh air system, ducts, and chases shall remain in base bid. All work associated with new stacked electrical rooms including conduits and conductors shall remain in base bid. All work associated with improvements to existing passenger elevators under Spec Section 142123.16 shall remain in base bid.

Alternate No. 6: Deduct from the Base Bid all labor & materials required to renovate apartments, corridors, and utility spaces at Floor 5 per drawings and specifications. Deduct all labor & materials required to demolish apartment Floor 6 per the drawings and spec section 024119 - Selective Demolition. Deduct $2,000 per apartment unit for appliances under Section 012100 Allowances. Deduct $100 per door for room identification signage under Section 012100 Allowances. All work associated with new service elevator shall remain in base bid. All work associated with fresh air system, ducts, and chases shall remain in base bid. All work associated with new stacked electrical rooms including conduits and conductors shall remain in base bid. All work associated with improvements to existing passenger elevators under Spec Section 142123.16 shall remain in base bid.

Alternate No. 7: Deduct from the Base Bid all labor & materials required to renovate apartments, corridors, and utility spaces at Floor 4 per drawings and specifications. Deduct all labor & materials required to demolish apartment Floor 5 per the drawings and spec section 024119 - Selective Demolition. Deduct $2,000 per apartment unit for appliances under Section 012100 Allowances. Deduct $100 per door for room identification signage under Section 012100 Allowances. All work associated with new service elevator shall remain in base bid. All work associated with fresh air system, ducts, and chases shall remain in base bid. All work associated with new stacked electrical rooms including conduits and conductors shall remain in base bid. All work associated with improvements to existing passenger elevators under Spec Section 142123.16 shall remain in base bid.

Alternate No. 8: Deduct from the Base Bid all labor & materials required to renovate apartments, corridors, laundry room, and utility spaces at Floor 3 per drawings and specifications. Deduct all labor & materials required to demolish apartment Floor 4 per the drawings and spec section 024119 - Selective Demolition. Deduct $2,000 per apartment unit for appliances under Section 012100 Allowances. Deduct $100 per door for room identification signage under Section 012100 Allowances. All work associated with new service elevator shall remain in base bid. All work associated with fresh air system, ducts, and chases shall remain in base bid. All work associated with new stacked electrical rooms including conduits and conductors shall remain in base bid. All work associated with improvements to existing passenger elevators under Spec Section 142123.16 shall remain in base bid.

Alternate No. 9: Deduct from the Base Bid all labor & materials required to renovate apartments, corridors, and utility spaces at Floor 2 per drawings and specifications. Deduct all labor & materials required to demolish apartment Floor 3 per the drawings and spec section 024119 - Selective Demolition. Deduct $2,000 per apartment unit for appliances under Section 012100 Allowances. Deduct $100 per door for room identification signage under Section 012100 Allowances. All work associated with new service elevator shall remain in base bid. All work associated with fresh air system, ducts, and chases shall remain in base bid. All work associated with new stacked electrical rooms including conduits and conductors shall remain in base bid. All work associated with improvements to existing passenger elevators under Spec Section 142123.16 shall remain in base bid.

Alternate No. 10: Deduct all labor & materials required to install service elevator car, doors, rails, motors, hoistway equipment, and controls for a complete, functioning elevator in accordance with Specification Section 142123.16. (Construction of elevator shaft, hoist beam, steel door frames, pit, conduits, and drain complete and ready for elevator installation shall remain in base bid.)

END OF SECTION 012300

SECTION 013100
PROJECT COORDINATION AND MANAGEMENT

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to, the following:

- Coordination.
- Administrative and supervisory personnel
- General installation provisions.
- Cleaning and protection.

Field engineering is included in Division 1 Section "Field Engineering".

Progress meetings, coordination meetings and pre-installation conferences are included in Division 1 Section "Project Meetings".

Requirements for the Contractor's Construction Schedule are included in Division 1 Section "Submittals".

COORDINATION

Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair. Make adequate provisions to accommodate items scheduled for later installation.

Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

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

- Preparation of schedules.
- Installation and removal of temporary facilities.
- Delivery and processing of submittals.
- Progress meetings.
- Project Close-out activities.

Conservation: Coordinate construction activities to ensure that operations are carried out with

consideration given to conservation of energy, water, and materials.

Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work.

SUBMITTALS

Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

Show the interrelationship of components shown on separate Shop Drawings.
Indicate required installation sequences.
Comply with requirements contained in Division 1 Section "Submittals."

Staff Names: Within 15 days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

PART 2 - PRODUCTS: (Not Applicable).

PART 3 - EXECUTION

GENERAL INSTALLATION PROVISIONS

Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

Recheck measurements and dimensions, before starting each installation.

Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

CLEANING AND PROTECTION

During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

Excessive static or dynamic loading.
Excessive internal or external pressures.
Excessively high or low temperatures.
Excessively high or low humidity.
Air contamination or pollution.
Water or ice.
Solvents.
Chemicals.
Puncture.
Abrasion.
Heavy traffic.
Soiling, staining and corrosion.
Rodent and insect infestation.
Combustion.
Unusual wear or other misuse.
Contact between incompatible materials.
Destructive testing.
Excessive weathering.
Unprotected storage.
Improper shipping or handling.
Theft.
Vandalism.

END OF SECTION

SECTION 013300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:

- Contractor's construction schedule.
- Submittal schedule.
- Shop Drawings.
- Product Data.
- Samples.

Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

- Permits.
- Applications for payment
- Performance and payment bonds.
- Insurance certificates.
- List of Subcontractors.

The Schedule of Values submittal is included in Division 1 Section "Applications for Payment."

Inspection and test reports are included in Section "Quality Control Services."

SUBMITTAL PROCEDURES

Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that requires sequential activity.

Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.

No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.

CONTRACTOR'S CONSTRUCTION SCHEDULE

Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule. Submit within 30 days of the date established for "Commencement of the Work".

Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.

Phasing: Provide notations on the schedule to show how the sequence of Work is affected by the requirements for phased completion to permit Work by separate Contractors prior to Substantial Completion.

Work Stages: Indicate important stages of construction for each major portion of the Work, including testing and installation.

Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

SHOP DRAWINGS

Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered an acceptable Shop Drawing submittal.

Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

Dimensions.
Identification of products and materials included.
Compliance with specified standards.
Notation of coordination requirements.
Notation of dimensions established by field measurement.

Initial Submittal: If not submitted in electronic format, submit 5 blue- or black-line prints for the Architect's review; two prints will be returned. All of the prints returned shall be marked-up and maintained as "Record Documents".

Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

PRODUCT DATA

Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams/templates, standard wiring diagrams, etc. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

Manufacturer's printed recommendations.
Compliance with recognized trade association standards.
Compliance with recognized testing agency standards.
Application of testing agency labels and seals.
Notation of dimensions verified by field measurement.
Notation of coordination requirements.

Submittals: If not submitted in electronic format, submit 5 copies of each required submittal. The Architect will retain three, and will return the others marked with action taken and corrections or modifications required.

Do not proceed with installation until an applicable copy of Product Data is in the installer's possession.

Do not permit use of unmarked copies of Product Data in connection with construction.

SAMPLES

Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.

ARCHITECT'S ACTION

Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly.

Compliance with specified characteristics is the Contractor's responsibility.

Action Stamp: The Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

Final Unrestricted Release: Where submittals are marked "No Exceptions Taken," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

Final-But-Restricted Release: When submittals are marked "Approved as Noted," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents.

Returned for Resubmittal: When submittal is marked "Not Approved, Revise and Resubmit," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

Do not permit submittals marked "Not Approved, Revise and Resubmit" to be used at the Project site, or elsewhere where Work is in progress.

Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action Not Required".

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section specifies administrative and procedural requirements for quality control services.

Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Architect.

Inspection and testing services are required to verify compliance with specifications. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.

Inspections, tests and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.

Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

RESPONSIBILITIES

Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services, to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor’s responsibility in the record documents or in common accepted practice, are provided by another identified entity. Costs for these services shall be not included in the Contract Sum.

Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.

Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

Security and protection of samples and test equipment at the Project site.

Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

The agency shall notify the Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition to Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

SUBMITTALS

The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Architect, in duplicate. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

QUALITY ASSURANCE

Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

REPAIR AND PROTECTION

General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for "Cutting and Patching."

Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION

SECTION 014200
REFERENCE STANDARDS

PART 1 - GENERAL

RELATED DOCUMENTS

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

DEFINITIONS

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

Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.

Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."

Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

Installer: An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor, for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

> The term "experienced" when used with the term "Installer" means having a minimum of 5 previous Projects similar in size and scope to this Project, being familiar with the precautions required, and having complied with requirements of the authority having jurisdiction.
>
> Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings.

Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

SPECIFICATION FORMAT AND CONTENT EXPLANATION

Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-Division format and MASTERFORMAT numbering system.

Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

Abbreviated Language: Language used in Specifications and other Contract Documents is the abbreviated type. Implied words and meanings will be appropriately interpreted. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the full context of the Contract Documents so indicates.

Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted. The words "shall be" shall be included by inference wherever a colon (:) is used within a sentence or phrase.

INDUSTRY STANDARDS

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

Publication Dates: Where the date of issue of a referenced standard is not specified, comply with the standard in effect as of date of Contract Documents.

Conflicting Requirements: Where compliance with two or more standards is specified, and the standards establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding.

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

Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.

Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.

Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

GOVERNING REGULATIONS/AUTHORITIES

The Architect has contacted authorities having jurisdiction where necessary to obtain information necessary for preparation of Contract Documents; that information may or may not be of significance to the Contractor. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.

SUBMITTALS

Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments,

judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

SUMMARY

This Section specifies requirements for temporary services and facilities, including security and protection facilities, temporary utilities, and construction and support facilities.

Security and protection facilities required include but are not limited to:
- Security fencing and lockable gates.
- Barricades, warning signs, lights.

Temporary utilities required include but are not limited to:
- Water service and distribution.
- Temporary electric power and light.
- Telephone service.
- Temporary Heating and Cooling

Temporary construction and support facilities required include but are not limited to:
- Field offices and storage sheds.
- Sanitary facilities, including drinking water.
- Dewatering facilities and drains.
- Temporary enclosures.
- Construction aids and miscellaneous services and facilities.
- Temporary heating and cooling.
- Waste disposal services.

Fabric fence screening required include but are not limited to:
- Perimeter of security fencing.

SECURITY

Construction and Storage Area: All activities relating to Contractor's work on the Project shall be conducted within the designated area as determined by the Owner and General Contractor.

Quality Assurance Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

PART 2 - PRODUCTS

MATERIALS

General: Provide new materials or previously used materials in good serviceable condition. Provide materials suitable for the use intended.

Open-Mesh Security Fencing: Provide 11-gage, galvanized 2-inch, chain link fabric fencing 6-feet high with galvanized steel pipe posts, 1-1/2" I.D. for line posts and 2-1/2" I.D. for corner posts. Provide security fencing around the perimeter of the building site as determined by the Owner and the Contractor to properly protect the general public and the existing sitework improvements from the construction traffic in progress. Fence to have access gate large enough for Contractor to bring in all necessary trucks and service equipment. Gate to be equipped with locks to provide security for the construction site. Exact location of security fencing to be determined by the Owner and the Contractor.

Fabric Fence Screen: Provide dark colored fabric fence screening with logos of Owner, Contractor and Architect printed in white. Coordinate material color and logo designs with Architect. Fasten continuous fabric screening to security fencing with black zip ties.

EQUIPMENT

General: Provide new equipment or previously used equipment in good serviceable condition. Provide equipment suitable for use intended.

Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar non-absorbent material.

First Aid Supplies: Comply with governing regulations.

Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.

PART 3 - EXECUTION

INSTALLATION

Use qualified personnel for installation of temporary facilities. Locate all facilities within the designated Construction and Storage Area, and where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

SECURITY AND PROTECTION FACILITIES INSTALLATION

Store combustible materials in containers in fire-safe locations.

Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting.

Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.

Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

TEMPORARY UTILITY INSTALLATION

General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.

Interruption of Utilities: Contractor shall schedule with the Owner and the utility company whenever service must be interrupted to make connections for temporary services.

Provide adequate utility capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.

Use Charges: The Contractor is responsible for making connections and distributions from existing locations. Owner will pay cost of electricity and water provided these services are connected to panels and piping within the existing building.

Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.

Temporary Electric Power Service: Provide grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.

Temporary Telephones: At contractor's option, provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period. Install telephone on a separate line for each temporary office and first aid station.

TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

Locate field offices, storage sheds, sanitary facilities and all other temporary construction and support facilities within the Construction and Storage area designated on the Drawings.

Maintain temporary construction and support facilities until Substantial Completion.

Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings.

Storage Sheds: Install storage sheds, sized, furnished and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the Construction and Storage Area.

Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

Use of the Owner's existing toilet facilities will not be permitted.

Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.

Project Identification Sign: Project job sign will be furnished and installed by the Contractor in location as determined by the Owner. Job sign will be designed by the Architect and will be paid for under the signage allowance as specified in Section 01020. **No other signage including Contractor's or Subcontractor's business signs will be allowed on the site or highway right-of-ways.**

OPERATION, TERMINATION AND REMOVAL

Termination and Removal: Unless the Architect requires that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion.

END OF SECTION

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 - GENERAL

SUMMARY

This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

Administrative procedures for handling requests for substitutions made after award of the Contract are included under Section "Product Substitutions."

QUALITY ASSURANCE

Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

When specified products are available only from sources that do not or cannot produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect for a determination of the most important product qualities before proceeding. The Contractor shall place orders for specified materials and equipment promptly. No excuse or proposed substitution will be considered for materials and equipment due to unavailability unless proof is submitted that firm orders were placed well in advance of their need for incorporation into the project.

PRODUCT DELIVERY, STORAGE, AND HANDLING

Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.

Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.

Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.

Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

PRODUCT SELECTION

General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.

Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:

Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. Substitutions will only be permitted if the product is proven to be an approved equal.

Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

Semi-proprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. Substitutions will only be permitted if the product is proven to be an approved equal.

Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.

Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.

Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.

Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division-1 for allowances that control product selection, and for procedures required for processing such selections.

PART 3 - EXECUTION

INSTALLATION OF PRODUCTS

Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

END OF SECTION

SECTION 017300
EXECUTION, CUTTING AND PATCHING

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section specifies administrative and procedural requirements for cutting and patching.

Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

> Requirements of this Section apply to mechanical and electrical installations. Refer to Division 15 and Division 16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

SUBMITTALS

Reinforcement: Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

Approvals: Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

QUALITY ASSURANCE

Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

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

PART 2 - PRODUCTS

MATERIALS

Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect, subject to approval of the Architect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

INSPECTION

Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

Conflicts: Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

PREPARATION

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

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

Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated, until provisions have been made to bypass them.

PERFORMANCE

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

Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.

By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated, or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

FINISHES

General: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.as specified below.

Altered Spaces: Any spaces altered or renovated, or any spaces with existing finishes affected by work under this Contract, shall have new finishes as necessary to restore space to original condition. The minimum acceptable changes to finishes shall be as follows:

Floors: Where, as a result of alteration or change, existing flooring is not continuous, install new flooring over entire room.

Partitions: New partitions shall receive finishes to match remainder of space in which they are placed.

Existing finishes: Where existing finishes are patched or new finishes added thereto, installation methods shall match existing work.

Painting where required to satisfy requirements shall be from floor to ceiling and from wall to wall.

Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken containing the patch, after the patched area has received primer and second coat.

Ceilings: Any alteration to existing ceilings, including raising, lowering, removal or replacement shall include all necessary adjustments to all items of mechanical and electrical equipment. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

END OF SECTION

SECTION 017700
PROJECT CLOSEOUT

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section specifies administrative and procedural requirements for project closeout, including but not limited to:

Inspection procedures.
Project record document submittal.
Operating and maintenance manual submittal.
Submittal of warranties.
Final cleaning.

Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions-2 through 16.

SUBSTANTIAL COMPLETION

Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.

When the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

Advise Owner of pending insurance change-over requirements.

Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.

Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.

Make final change-over of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of change-over in security provisions.

Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site.

Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

The Architect will repeat inspection when requested and assured that the Work has been substantially completed.

Results of the completed inspection will form the basis of requirements for final acceptance.

FINAL ACCEPTANCE

Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

Submit an updated final statement, accounting for final additional changes to the Contract Sum.

Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect.

Submit final meter readings for utilities and similar data as of the date of Substantial Completion, or when the Owner took possession of and responsibility for corresponding elements of the Work.

Submit consent of surety to final payment.

Submit a signed Statutory Affidavit.

Submit waiver of liens from each subcontractor and material supplier involved with the job.

Submit record drawings, maintenance manuals, final project photographs, and similar final record information.

Deliver tools, spare parts, extra stock, and similar items.

Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

Re-inspection Procedure: The Architect will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed.

Upon completion of reinspection, the Architect will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

If necessary, reinspection will be repeated.

RECORD DOCUMENT SUBMITTALS

General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.

Record Drawings: Maintain a clean, undamaged set of blueprints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.

Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.

Note related Change Order numbers where applicable.

Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size.

PART 3 - EXECUTION

CLOSEOUT PROCEDURES

Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives.

FINAL CLEANING

General: General cleaning during construction is required by the General Conditions and included in Section "Temporary Facilities".

Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion:

Remove labels that are not permanent labels.

Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

Clean the site, including landscape development areas, of rubbish, litter and foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits.

Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION

SECTION 017823
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Related Documents: Drawings, General and Supplementary Conditions, and applicable provisions of other Division 1 Sections apply to this Section.

1.02 SUMMARY:

A. Work Included: This Section includes closeout submittal requirements and procedures required at Substantial Completion and Final Completion of the Work.

B. Related Work: Additional specific requirements are specified in the various Sections of Divisions 2 through 16 of these Specifications.

C. Related Documents: Drawings, General and Supplementary Conditions, and applicable provisions of Division 1 Sections apply to this Section.

1.03 SUBMITTALS:

A. General
1. Required closeout submittals, whether specified herein or in the individual Division 2 through 16 Specifications Sections, must be delivered to Architect prior to and as condition precedent to Final Completion of the Work.
2. Where the number of required submittals is not specified, submit not less than two (2) copies.

B. Record Documents - General
1. Additional or specific requirements for Record Documents are indicated in individual Sections of these Specifications.
2. Do not use Record Documents for construction purposes; protect from deterioration and loss in a secure, fire resistive location.
3. Provide access to Record Documents for Architect's reference during normal working hours.
4. Review Record Documents for progress and accuracy at regularly scheduled job progress meetings.
5. Upon completion of mark-up, submit Record Documents to Architect for Owner's records.

C. Record Drawings (Field Set)
1. Maintain at the Project site during the course of the Work a white print set (blueline or blackline) of Contract Drawings and shop drawings in clean, undamaged condition, with mark-ups of actual installations that vary substantially from the Work as originally shown.
2. Mark whichever drawing is most capable of showing "field" condition fully and accurately; however, where shop drawings are used for mark up, record a cross-reference at corresponding locations on the Contract Drawings.
3. Mark changes or deviations with red non-erasable pencil. Where feasible, use other colors to distinguish between variations in separate categories of work.
4. Record new information that is recognized to be of importance to Owner, but was not shown on either the Contract Drawings or shop drawings. Give particular attention to concealed work that would be difficult to measure and record at a later date. Note related Change Order or Field Order numbers where applicable.
5. Record all deviations in sizes, locations, or other features of work from the Contract Documents. It shall be possible, using these drawings, to correctly and easily locate, identify, and establish sizes of all piping, directions of flow, and other features of the Work which will be concealed in finished work or underground.
6. Establish locations of concealed and underground work by accurate dimensions to column lines or permanent walls, locating all bends or turns, and properly referencing invert elevations and rates of fall.
7. Organize Record Drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates, and other identification on cover of each set.

D. Final Record Drawings (As-Builts)
   1. Obtain a set of clean reproducible transparencies (mylar or sepia) of the original Contract Drawings from Architect. The cost of these reproducible transparencies will be paid by Owner.
   2. Submit the final marked-up field copy of Record Drawings to Architect for review and approval.
   3. Upon receipt of field copy of Record Drawings back from Architect, carefully and neatly transfer the information contained thereon to the reproducible transparency set of Drawings using standard drafting techniques. Call attention to deviations or changes by drawing a "cloud" around the affected area.
   4. Clearly label each final Record Drawing with the words "AS-BUILT RECORD DRAWING", the date submitted, and the name or initials of the person preparing the drawing, stamped or neatly printed in conspicuous block letters near the lower left corner of the sheet. Label shall not cover or obscure other information.
   5. Submit final As Built Documents for Architect's review and approval. Make any necessary changes or corrections prior to delivery to Owner.

E. Record Specifications
   1. Maintain one copy of Specifications, including Addenda, Change Orders, and similar modifications issued in printed form during construction. Mark up variations of substance in actual Work in comparison with text of Specifications and modifications as issued.
   2. Give particular attention to substitutions, selection of options, and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation.
   3. Note related Record Drawing information and product data where applicable.
   4. Label Record Specifications with the words "RECORD COPY" and the date submitted, stamped or neatly printed in block letters on the cover.

F. Operations and Maintenance Manuals
   1. Organize maintenance and operating manual information into suitable sets of manageable size, and bind into individual binders properly identified and indexed.
   2. Include name and telephone number of manufacturer, local supplier, and installer, emergency instructions, spare parts listings, copies of warranties or guarantees, wiring diagrams, recommended "turn around" cycles, inspection procedures, shop drawings, product data, and similar applicable information.
   3. Bind each manual of each set in a heavy duty, 3-ring, vinyl covered binder. Provide typed index dividers for each item contained therein, and include pocket folders for folded sheet information. Mark identification of both front and spine of each binder.
   4. Unless otherwise indicated or directed by Architect, submit three (3) copies of operating and maintenance manuals.

G. Keys and Keying Schedules: Neatly label and submit all change keys, master keys, and grandmaster keys, along with final keying schedule, to Owner in accordance with the requirements of Section 08710.

H. Maintenance Materials: Submit maintenance materials, extra or "attic" stock, and spare parts required by the various Specifications Sections to Owner as directed. Submit materials in manufacturer's original packaging or containers, clearly marked as to color and location in the Work.

I. Other Documents: Submit the required number of the following additional documents that may be required by the various Specifications Sections:
   1. Certificates of Compliance with applicable reference standards.
   2. Certificates of Inspection or other evidence of compliance with governmental agencies or authorities having jurisdiction over the Work.
   3. Warranties, guarantees, and bonds.
   4. Certificates of Insurance for products and completed operations,
   5. Written consent of Surety.
   6. Evidence of payment and release of liens for subcontractors, suppliers, and other goods and services.
   7. List of subcontractors, service organizations, and suppliers, including names of contact person, and telephone numbers for office hours and after-hours emergency contact.

8. Notarized letter signed by the Contractor acknowledging the date of Substantial Completion or other date or dates established for the commencement of warranties and guarantees.

END OF SECTION

SECTION 017836
WARRANTIES

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.

Specific requirements for warranties for the Work and products and installation that are specified to be warranted, are included in the individual Sections of Divisions-2 through -16.

Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

WARRANTY REQUIREMENTS

Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

WARRANTY SCHEDULE

Roofing System: New roof membrane and system components shall be warranted in accordance with specification section 075400 Thermoplastic Membrane Roofing (TPO).

Sheet Metal Flashing & Trim: Sheet metal finishes shall be warranted in accordance with specification section 076200 Sheet Metal Flashing & Trim.

Joint Sealants: Exterior sealants used to seal window frames to openings and between existing and new frames shall be warranted in accordance with specification section 079200 Joint Sealants.

Insulated Glass Units: Insulated glass units shall be warranted in accordance with specification section 088100 Glass and Glazing.

SUBMITTALS

Submit written warranties to the Architect prior to the installation date of the product or material system under warranty.

When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.

Form of Submittal: Compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

PART 2 - PRODUCTS (not applicable).

PART 3 - EXECUTION

Provide manufacturers standard warranties and warranties and bonds on products and installations as specified.

END OF SECTION

SECTION 021410
INDEPENDENT TESTING LABORATORY SERVICES - ASBESTOS

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. This section describes the requirement to conduct compliance inspections and perform air monitoring activities in conjunction with asbestos abatement.

B. Alternative Construction & Environmental Solutions, Inc. (ACES) has been engaged by the Owner to perform these required testing services. The on-site representative of ACES shall serve as the Owner's representative and shall be responsible for compliance inspections, air monitoring, and enforcing contract plans and specifications. The Contractor shall pay for this air monitoring at a rate of $450.00 per shift (a shift shall be considered 9 hours or fraction there of). This shall be paid direct to Alternative Construction & Environmental Solutions, Inc. upon receipt of invoices documenting the services expended. The Contractor's final pay request will not be processed until all air monitoring invoices are paid. For purposes of determining the need for air monitoring, any time an asbestos control area is established and workers are in the area; air monitoring will be required.

C. The on-site representative of the independent testing firm shall maintain daily reports of activities taking place on the job site, problems encountered, decisions reached, unusual conditions, visitors to the job site, and general conditions on the job site. These reports shall be given to the Owner upon completion of the project.

D. A complete record of all testing results, certified by the independent testing laboratories, shall be furnished to the Owner upon completion of the project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 AIR MONITORING DURING ASBESTOS ABATEMENT

A. Phase contrast microscopy (PCM) analysis of background, daily and final clearance air samples shall be performed on site using NIOSH Method 7400. Verbal results shall be available within 12 hours and written results posted at the job site within 24 hours. Hand-written chain-of-custody forms indicating analysis results shall be acceptable for posting at the job site

B. Air samples shall be collected and analyzed on the following schedule:

1. Five background samples from each established regulated area where friable and/or non-friable materials will be abated prior to any activity that will disturb the materials.

2. Once abatement activities begin, daily air samples shall be collected from the following areas:

   a. Entrance to the clean room of the personnel decontamination facility.

   b. Equipment (dirty) room of the personnel decontamination facility.

   c. Outside the regulated area in uncontaminated areas of the building.

d. Exhaust of the air circulation and filtration system. If more than one air circulation and filtration machine is used, exhaust of each machine shall be tested at least once a day.

3. Five final clearance air samples shall be collected from each regulated area that has successfully passed a visual inspection.

C. Should the regulated area not clear final air clearance tests due to the Contractor's failure to properly clean the area, subsequent cleaning, inspection, and final air clearance testing shall be performed at no additional cost to the Owner.

D. Decontamination of the regulated area is not complete until results of final air clearance samples indicate the standards outlined in SECTION 01714 REGULATED AREA CLEARANCE have been met.

END OF SECTION

SECTION 021563
DECONTAMINATION UNITS FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 GENERAL

A. Provide separate Personnel and Equipment Decontamination facilities during asbestos abatement. Require that the Personnel Decontamination Unit be the only means for workers and visitors to ingress and egress the regulated area.

B. Require that all materials and equipment exit the regulated area through the Equipment Decontamination Unit.

PART 2 - PRODUCTS

2.01 POLYETHYLENE PLASTIC SHEETING

A. Provide polyethylene plastic sheeting in the largest sheet size possible to minimize seams: 6-mil thickness, clear, frosted, and/or black as required.

B. Polyethylene plastic sheeting shall be flame resistant and conform to the National Fire Protection Association Standard 701, "Small-Scale Fire Test For Flame-Resistant Textiles and Films".

2.02 ADHESIVES

A. Duct tape shall be a minimum of two inches wide with an adhesive formulated to stick aggressively to polyethylene plastic sheeting.

B. Spray adhesives shall be formulated to stick aggressively to polyethylene plastic sheeting.

PART 3 - EXECUTION

3.01 PERSONNEL DECONTAMINATION UNIT

A. Provide a personnel decontamination unit consisting of a serial arrangement of connected rooms or spaces (clean [change] room, shower room, equipment [dirty] room) separated from each other and from the regulated area by airlocks. A schematic diagram of a typical decontamination unit is illustrated in an attachment to this section. Require all persons without exception to pass through this decontamination unit for entry into and exiting from the regulated area for any purpose. Do not allow parallel routes for entry or exit. Do not remove equipment or materials through personnel decontamination unit. Provide temporary lighting within decontamination units as necessary to reach a lighting level of 100-foot candles.

B. Provide a clean room that is physically and visually separated from the rest of the building for the purpose of changing into protective clothing.

C. Provide an airlock between shower room and clean room. This is a transit area for workers. An airlock is a system for permitting entrance and exit with minimum air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways separated by a distance of at least three (3) feet.

D. Provide a watertight operational shower to be used for transit by cleanly dressed workers heading for the regulated area from the clean room, or for showering by workers headed out of the regulated area after undressing in the equipment room. Contaminated water from the shower room shall be either drummed or drained to the sanitary sewer system. Filtering of the water prior to disposal is

required. No water shall be allowed to leak or drain outside of the regulated area or the shower room.

E. Provide an airlock between shower room and equipment room. This is a transit area for workers.

F. Construct an equipment room and require work equipment, footwear and additional contaminated work clothing to be left here. This is a change and transit area for workers.

G. Separate the regulated area from the equipment room by polyethylene barriers. If the airborne asbestos level in the regulated area is expected to be high, add an intermediate cleaning space between the equipment room and the regulated area. Damp wipe-clean all surfaces of the equipment room after each shift change. Provide one additional drop cloth of 6-mil polyethylene on the floor of the equipment room per shift change and remove contaminated layer after each shift.

3.02 DECONTAMINATION SEQUENCE

A. Require that all workers adhere to the following sequence when entering or leaving the regulated area.

1. Worker enters clean room and removes street clothing, puts on clean disposable coveralls and respirator, and passes through the airlock to the shower room, through a second airlock and into the equipment room.

2. Any additional clothing and equipment left in the equipment room needed by the worker are retrieved at this time.

3. Worker proceeds to regulated area.

4. Before leaving the regulated area, require the worker remove all gross contamination and debris from coveralls and feet.

5. The worker then proceeds to the equipment room and removes all clothing except respiratory protection equipment.

6. Extra work clothing such as boots, hard hats, goggles, and gloves are to be stored in contaminated end of the equipment room.

7. Disposable coveralls are placed in a bag for disposal with other waste material.

8. After showering and shampooing, the worker moves to the clean room and dresses in either new coveralls for another entry to the regulated area, or street clothes if leaving the work site.

3.03 EQUIPMENT DECONTAMINATION UNIT

A. Provide an equipment decontamination unit consisting of a serial arrangement of rooms (holding room, wash room, ramp) for removal of equipment and material from the regulated area. Do not allow personnel to enter or exit regulated area through equipment decontamination unit.

B. A schematic diagram of a typical equipment decontamination unit is illustrated in an attachment to this Section.

C. Provide an enclosed washroom located adjacent to the regulated area for cleaning of bagged or containerized asbestos-containing waste materials.

D. Provide a holding area separated from the adjacent rooms by flap doors fabricated from 6-mil polyethylene plastic sheeting.

E. Provide a load out area from the equipment decontamination unit to an enclosed truck or other suitable waste container.

3.04 LOAD OUT AREA

A. The load out area is the transfer area from the building to a truck or dumpster. It may be a ramp leading from the equipment decontamination unit, a separate room or a loading dock area.

B. During transfer of material from load out area erect primary barriers as necessary to seal path from load out area to truck or dumpster.

3.05 SIGNS

A. Post an approximately 20 inch by 14 inch manufactured caution sign at each entrance to the regulated area displaying the following legend as required by 29 CFR 1926.1101.

B. Provide signs as follow:

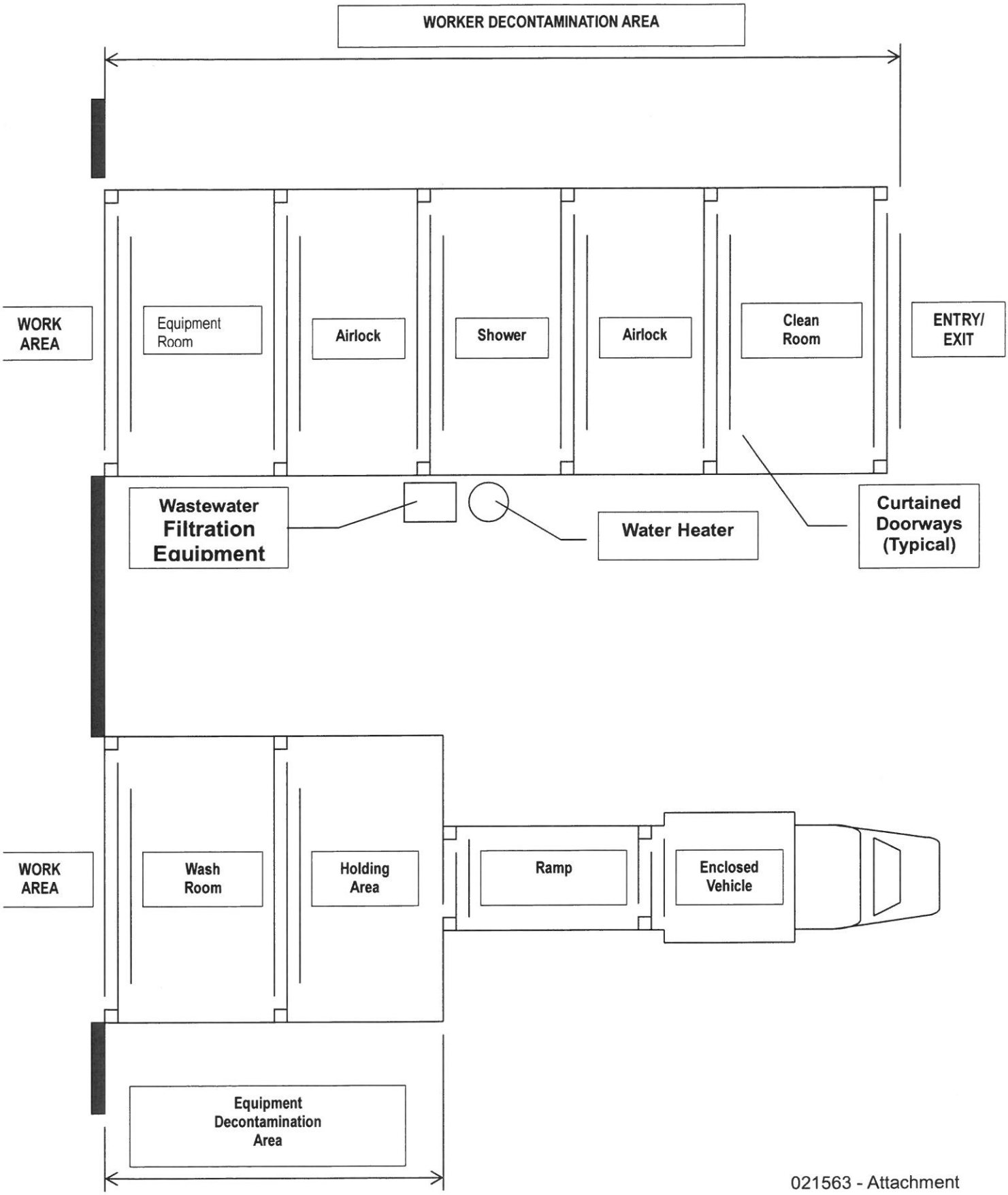
DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA
AUTHORIZED PERONNEL ONLY

C. Post an approximately 10 inch by 14 inch manufactured sign at each entrance to each regulated area displaying the following legend with letter sizes and styles of a visibility at least equal to the following:

Legend	Notation
NO FOOD, BEVERAGES OR TOBACCO PERMITTED	3/4" Block
ALL PERSONS SHALL DON PROTECTIVE CLOTHING (COVERINGS) BEFORE ENTERING THE REGULATED AREA	3/4" Block
ALL PERSONS SHALL SHOWER IMMEDIATELY AFTER LEAVING REGULATED AREA AND BEFORE ENTERING THE CHANGING AREA	3/4" Block

END OF SECTION

SKETCH OF TYPICAL PERSONNEL AND EQUIPMENT DECONTAMINATION UNITS
FOR ASBESTOS ABATEMENT



021563 - Attachment

SECTION 021711
PROJECT DECONTAMINATION FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF REQUIREMENTS

A. The scope of work involves abatement of damaged and undamaged friable asbestos containing material. The material shall be thoroughly wetted with amended water prior to and during removal. The decontamination procedure is a three-step cleaning process.

B. Operation of an air filtration system shall be used to create diminished pressure and to move contaminated air away from the workers breathing zone. Diminished pressure must be maintained for the duration of the project. Duration for the project shall be considered from the time critical barrier construction is completed through the time acceptable final clearance air monitoring results are obtained.

1.02 REGULATED AREA CLEARANCE

A. Air testing and other requirements that must be met before release of the Contractor and reoccupying the area are specified in SECTION 01714 REGULATED AREA CLEARANCE.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 GENERAL

A. Work of this section includes decontamination of air in the regulated area which has been, or may have been contaminated by elevated airborne asbestos fiber levels generated during abatement activities, or which may previously have had elevated fiber levels due to other sources of asbestos-containing materials in the space.

B. Work of this section includes the cleaning, decontamination, and removal of temporary facilities installed prior to abatement work, including:

1. Critical Barriers
2. Primary Barriers
3. Temporary Enclosures
4. Air Filtration System
5. Decontamination Units

3.2 START OF WORK

A. Work of this section begins with the cleaning of the regulated area with the following in place:

1. Critical barriers over openings, doorways, windows, HVAC ducts, etc.
2. Decontamination facilities for personnel and equipment in operating condition.
3. Air filtration system in operation.

3.03 FIRST CLEANING

A. Carry out a first cleaning of all surfaces in the regulated area by spraying a fine mist of amended water followed by wiping all surfaces with clean disposable rags or towels.

B. Immediately following this cleaning, remove primary barriers and the equipment decontamination unit leaving:

1. Critical barriers over openings, doorways, windows, HVAC ducts, etc.

2. Decontamination unit for personnel in operating condition.

3. Air filtration system in continuous operation.

3.04 SECOND CLEANING

A. Perform a second cleaning in the exact manner and order as the first cleaning.

3.05 ABATEMENT CONTRACTOR'S INSPECTION

A. Following this second cleaning, visually inspect all surfaces. Reclean if any dust, debris, etc., is found. Continue this cleaning process until no debris, dust or other material is found.

B. Wait 96 air changes to allow HEPA filtered fan units to clean air of airborne asbestos fibers. Maintain air filtration system in operation for the entire 96-air change period.

3.06 FINAL CLEANING

A. Carry out a final cleaning of all surfaces in the regulated area in the same manner as the previous cleaning.

3.07 VISUAL INSPECTION

A. After final cleaning perform a complete visual inspection of the entire regulated area including all surfaces as specified above; look for debris from any source, residue on surfaces, dust or other matter. When the area is visually clean and no debris, residue, dust or other material is found, complete the certification at the end of this section. Visual inspection is not complete until confirmed in writing.

B. Provide a minimum of 100-foot candles of lighting on all surfaces in the areas to be subjected to visual inspection. Provide hand held lights providing 150-foot candles at 4 feet capable of reaching all locations in regulated area.

3.08 FINAL AIR CLEARANCE TESTING

A. After the regulated area is found to be visually clean and encapsulated in accordance with SECTION 02081 - REMOVAL OF ASBESTOS CONTAINING MATERIALS, and been allowed to thoroughly dry, final air clearance samples will be taken and analyzed.

1. If Release Criteria are not met, repeat final cleaning and continue decontamination procedures from that point.

2. If Release Criteria are met, remove regulated area isolation.

3.09 REMOVAL OF REGULATED AREA ISOLATION

A. After all requirements of this section and requirements of SECTION 01714 - REGULATED AREA CLEARANCE have been met:

1. Shut down and remove the air filtration system. Seal HEPA filtered fan units, HEPA vacuums and similar equipment with 6-mil polyethylene sheet and duct tape to form a tight seal at intake end before being moved from regulated area.

2. Remove critical barriers. Remove any small quantities of residual material found upon removal of the plastic sheeting by wet wiping, HEPA filtered vacuum cleaners and local area protection. If significant quantities as determined by the Owner's Representative are found, then the entire area affected shall be decontaminated.

3. Remove all equipment, material, and debris from work site.

4. Dispose of all asbestos-containing waste material in accordance with Federal, State and Local regulations.

5. Perform a final inspection.

3.10 SUBSTANTIAL COMPLETION OF ABATEMENT WORK

A. Asbestos abatement work for each area is substantially complete upon meeting the requirements of this section and SECTION 01714 - REGULATED AREA CLEARANCE, including submission of:

1. Certificate of Visual Inspection for each regulated area.

2. Receipts documenting proper disposal of the asbestos containing waste at a licensed landfill.

3. Punch list detailing repairs to be made and incomplete work to be performed.

3.11 CERTIFICATE OF VISUAL INSPECTION

A. A Certificate of Visual Inspection shall be completed for each regulated area prior to collection of final air clearance samples. The attached certificate shall be completed by the Contractor and certified by a representative of the Owner. Submit completed certificate with application for payment. Payment will not be made until this certificate is executed.

END OF SECTION

CERTIFICATION OF VISUAL INSPECTION FOR ASBESTOS ABATEMENT

In accordance with SECTION 021711 - PROJECT DECONTAMINATION, the Contractor hereby certifies that he has visually inspected all interior surfaces of the regulated area identified below and has found no dust, debris, or residue.

Area inspected: _____

By: (Signature): _____ Date: _____

(Print Name) _____

(Print Title) _____

OWNER'S REPRESENTATIVE'S CERTIFICATION

An authorized representative of the Owner hereby certifies that he has accompanied the Contractor on his visual inspection and verifies that this inspection has been thorough and to the best of his knowledge and belief, the Contractor's certification above is a true and honest one.

By: (Signature): _____ Date: _____

(Print Name) _____

(Print Title) _____

SECTION 021714
REGULATED AREA CLEARANCE FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Certificate of Visual Inspection specified in SECTION 01711 - PROJECT DECONTAMINATION.

1.02 SCOPE

A. This section describes work to be completed by an independent air monitoring and laboratory testing firm, sets forth required post-abatement airborne fiber concentration levels in the regulated areas, and describes testing procedures that will be used to measure these levels.

B. The laboratory selected for analyzing air samples shall possess current certification verifying their participation in the National Institute of Standards and Technology (NIST), National Voluntary Laboratory Accreditation Program (NVLAP) and the American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) Program.

1.03 CONTRACTOR RELEASE CRITERIA

A. The asbestos regulated area is cleared when the area is visually clean and airborne fiber concentrations have been reduced to the level specified below.

1.04 VISUAL INSPECTION

A. Work of this section will not begin until the visual inspection described in SECTION 01711 - PROJECT DECONTAMINATION is complete and has been certified on behalf of the Owner and the regulated area has been allowed to thoroughly dry.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 FINAL AIR CLEARANCE SAMPLES

A. Final air clearance samples will be collected and analyzed after completion of all cleaning required in SECTION 01711 PROJECT DECONTAMINATION.

B. The services of an independent air monitoring firm will collect and analyze final aggressive air clearance samples. A complete record, certified by the independent air monitoring firm, of all air monitoring tests and results will be furnished to the Owner upon completion of the project. Non-aggressive air sampling techniques may be used if conditions warrant but will be indicated on the general notes on the plans.

3.02 PHASE CONTRAST MICROSCOPY FINAL CLEARANCE TESTING

A. Phase Contrast Microscopy (PCM) shall be used to analyze final air clearance samples from each regulated area where final air clearance samples are required. A minimum of five (5) samples and two (2) blanks shall be collected from each area using 25-mm cassettes. The collection media and sampling shall be in accordance with 40 CFR 763 (AHERA Requirements).

B. The regulated area shall be considered ready for re-occupancy if results of each of the five (5) samples is less than or equal to 0.010 f/cc when analyzed in accordance with 40 CFR 763.

C. If the above air clearance levels are not attained, the Contractor shall be required to re-clean the area and perform additional final clearance testing. Such re-cleaning and re-testing will be performed at no additional cost to the Owner. The air-monitoring firm will perform the additional final clearance testing and the cost of said monitoring deducted from the contract sums as a deductive change order.

3.03 FINAL INSPECTION

A. Once decontamination of the regulated area has been confirmed, the temporary asbestos control area shall be removed. A final inspection shall be performed in accordance with SECTION - 01711 PROJECT DECONTAMINATION. Wet methods and/or HEPA vacuuming shall be used to clean any debris found.

END OF SECTION

SECTION 021800
SITE CLEAN UP AND POST-PROJECT SUBMITTALS

PART 1 - GENERAL

1.01 DAMAGE REPAIR

A. Any damage to surfaces and/or building components, other than those designated for demolition, caused by the Contractor's activity or his workers, shall be repaired or replaced at no additional cost to the Owner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 FINAL CONSTRUCTION SITE CLEAN UP

A. Work of this section shall be performed once the Contractor has successfully passed all required final visual inspections and final air clearance testing of the regulated areas, and all asbestos-containing waste and lead containing waste has been properly removed from the work site.

B. Prior to Owner's Representative's final inspection, the Contractor shall remove from within and around the building all debris, waste, trash, etc., generated by the Contractor's workers.

3.02 FINAL INSPECTION

A. The Owner's Representative shall set a date for the final inspection when a notice of readiness for final inspection is received from the Contractor. During this inspection the Owner's Representative shall make a written list of deficiencies.

B. When all deficient items have been corrected and accepted by the Owner's Representative, the Contractor may submit his application for payment.

3.03 POST-SUBMITTAL DOCUMENTS AND REQUEST FOR PAYMENT

A. Three (3) copies of the following documents shall be submitted to the Owner:

1. Copy of an approved notification for demolition and/or renovation from governing agency giving dates when removal will begin and be completed.

2. Proof of insurance naming the Owner and Consultant as additional certificate holder.

3. Copy of State of Georgia Asbestos Contractor's license.

4. Copy of State of Georgia asbestos license of the general supervisor(s) involved in the project.

5. Proof of asbestos worker training within the last 12 months for each employee involved in the project.

6. Proof of lead worker training within the last 12 months for each employee involved in this project.

7. Medical examination report for each employee of the Contractor who was involved in the project.

8. Respirator training for each employee of the Contractor who was involved in the project.

9. "Worker Release Form" for each employee of the Contractor who was involved in the project.

10. Safety Data Sheets for all hazardous chemicals incorporated in the work.

11. Regulated area sign in/sign out sheets and daily logs maintained by the Contractor's asbestos abatement supervisor.

12. Certificate of Visual Inspection for each regulated area signed by the Contractor and a representative of the Owner.

13. Waste Shipment Records and Chain of Custody Forms for asbestos and lead waste.

B. A copy of items 1 through 4 shall be submitted to the Owner through the Owner's consultant prior to start of work.

C. Post-submittals shall be bound in three-ring binders with each section tabbed or separated by a colored sheet of paper and cross-referenced to an index. The cover shall be labeled with the project name and inclusive dates. Three (3) copies of the post-submittals shall be forwarded to the Consultant at the following address within 10 days of project completion:

Alternative Construction & Environmental Solutions, Inc.
2247 Wrightsboro Road
Augusta, GA 30904
ATTN: Mr. Clifford Hampton

END OF SECTION

SECTION 022081
REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIAL

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. The scope of work in the W C Ervin Towers located at 1365 Laney Walker Blvd., Augusta, Georgia, involves the removal and disposal of both friable and non-friable asbestos-containing materials. The location and approximate quantities are shown on the drawings. The following is a brief summary of types of asbestos to abated:

1. Floor coverings (tile), cove base and associated mastics
2. Ceiling texture
3. Hard TSI pipe elbows and joints
4. Joint compound and associated wall panels
5. Black pipe and HVAC duct mastic
6. Asbestos cement transom panels (currently not under scope to be abated)

B. In addition to the material shown on the drawings, all construction debris and trash generated by the abatement of asbestos-containing materials shall be removed from the area on a daily basis and disposed as asbestos-containing waste.

1.02 MEDICAL REQUIREMENTS

A. Medical Examinations Before exposure to airborne asbestos fibers, the contractor will provide workers with a comprehensive medical examination as required by 29 CFR 1926.1101. This examination consists of a pulmonary function test and a chest x-ray at the discretion of the physician performing the physical. The same examination is required on an annual basis to all employees engaged in an occupation involving asbestos fibers.

B. Medical Records The contractor shall establish and maintain accurate medical surveillance records for each employee subject to medical surveillance by 29 CFR 1926.1101 and shall maintain the records for the duration of employment plus 30 years in accordance with 29 CFR 1910.20.

1.03 TRAINING CERTIFICATION AND PROJECT SUPERVISION

A. Supervisor A supervisor shall be present at all times asbestos abatement is in progress. The supervisor shall have completed a course at an EPA approved training center, or equivalent certificate course, in asbestos abatement procedures and be licensed by the Georgia Department of Natural Resources Environmental Protection Division. The supervisor shall have had a minimum of two years on-the-job experience in asbestos abatement procedures and shall be a competent person as described in 29 CFR 1926.1101.

B. Worker Training Prior to assignment to this asbestos work project, the contractor shall provide instruction to each employee with regard to the hazards of asbestos safety and health precautions and the use and requirements of protective clothing and equipment including respirators. This instruction shall fully cover engineering and other hazard control techniques and procedures, and shall conform to training required by 40 CFR Part 763, Subpart E.

1.04 PERMITS, LICENSES AND NOTIFICATIONS

A. The contractor shall secure the necessary permits in conjunction with asbestos removal, hauling and disposal. Timely notification of such actions as may be required by Federal, State or Local authorities shall be made. Ten days notification prior to the start of work shall be required to secure a work permit from the Georgia Environmental Protection Division and a copy of this permit shall

be submitted to the Consultant prior to the start of this work. A copy of the permit shall be posted at the job site at all times.

1.05 RESPIRATORY PROTECTION PROGRAM

A. The contractor shall have a written respiratory protection program that governs the selection, use, maintenance and care of respirators. Workers shall be provided respirators approved by the National Institute for Occupational Safety & Health (NIOSH). The respirators will be used in accordance with Occupational Safety and Health Administration (OSHA) standards.

B. All respirators must be fitted with a HEPA filter designated by NIOSH for asbestos fiber protection (N, R or P 100).

1.06 CONTINGENCY PLAN

A. Contractor shall prepare a contingency plan for emergencies including fire, accident, power failure, pressure differential system failure, supplied air system failures, or other events that may require modification or abridgement of decontamination or work area isolation procedures.

B. Note that nothing in this abatement specification should impede safe exiting or providing adequate medical attention in the event of an emergency.

1.07 MECHANICAL AND ELECTRICAL SYSTEMS

A. The contractor shall take note where mechanical and/or electrical hazards are located and take necessary precautions in these areas.

1.08 COMPLIANCE WITH OSHA STANDARDS

A. It is the intent of this section for the contractor to comply fully with all Federal, State and Local regulations and codes regarding removal and disposal of asbestos-containing materials. Nothing in this section should be interpreted to conflict with this intent. Contractor is responsible to ensure worker safety complies with Occupational Safety and Health Administration (OSHA) safety requirements. Hard hats, eye goggles, gloves, safety belts, etc., shall be worn when work tasks require this additional safety protection.

B. No attempt has been made to specify all applicable Federal and/or State requirements dealing with worker safety or public safety within the confines of these specifications. This should not be construed as an abridgement of these requirements. As is always the case, the contractor has the responsibility to determine which non-specified requirements apply to his work and the responsibility to initiate steps to comply with these non-specified requirements on an as needed or required basis.

PART 2 - PRODUCTS

2.01 WETTING AGENTS AND ENCAPSULANTS

A. Surfactant Provide water to which a surfactant has been added. Use a mixture of surfactant and water that results in wetting of the asbestos containing material and retardation of fiber release during disturbance.

B. Encapsulant Provide an encapsulant designed specifically to lock down asbestos fibers during and following asbestos abatement. Use in strict compliance with manufacturer's instructions.

2.02 POLYETHYLENE PLASTIC SHEETING

A. Polyethylene plastic sheeting in the largest sheet size possible to minimize seams shall be available, 4-mil and 6-mil thickness, clear, frosted and/or black, as required.

B. Provide reinforced polyethylene plastic sheeting in the largest sheet size possible to minimize seams, 6-mil thickness, clear, frosted or black.

C. Polyethylene plastic sheeting shall be flame resistant and conform to the National Fire Protection Association Standard 701, "Small-Scale Fire Test for Flame-Resistant Textiles and Films."

2.03 ADHESIVES

A. Provide duct tape at least three inches wide with an adhesive formulated to stick aggressively to polyethylene plastic sheeting.

B. Provide spray adhesive formulated to stick aggressively to polyethylene plastic sheeting.

2.04 DISPOSAL BAGS

A. Provide 6-mil thick, leak-tight polyethylene plastic bags labeled in accordance with Paragraph k(7)(iii), 29 CFR 1926.1101.

2.05 HIGH EFFICIENCY PARTICULATE ABSOLUTE (HEPA) FILTERS

A. Provide vacuum cleaner, air filtration machine, and respirators with a HEPA filter capable of filtering particles of 0.3 microns or greater at 99.97% efficiency.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Personal Protection

1. Respirators Provide respirators that are the most comfortable and afford the best seal and protection. Cartridge filters shall be approved for respiratory protection against fumes, dusts, and mists having a permissible exposure limit of less than 0.05 milligrams per cubic meter (a HEPA filter). At a minimum, workers shall be provided half-face, negative pressure respirators equipped with a HEPA filter. A clean set of cartridge filters shall be provided workers upon each entry into the regulated area. All individuals entering the asbestos regulated area after the commencement of asbestos removal work shall be required to wear respiratory protection.

2. Protective Clothing A sufficient number of disposable full body coveralls shall be available to provide each worker a clean suit upon each entry into the regulated area.

B. Ground Fault Protection

1. Equip all circuits for any purpose entering the regulated area with ground fault circuit interrupters (GFCI). Locate GFCIs outside the regulated area so that all circuits are protected prior to entry into the regulated area. Provide circuit breaker type GFCI equipped with test button and reset switch for all circuits to be used for any purpose in the regulated area, decontamination unit, exterior, or as otherwise required by National Electrical Code, OSHA or other authority. Locate the panel exterior to the regulated area.

2. Use only grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Use single lengths or use waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas of work.

C. Signs and Labels

1. Warning signs shall be displayed at the entrance to the regulated area. Signs shall be posted at such a distance from the regulated area that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. The warning signs shall bear the following information:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA
AUTHORIZED PERONNEL ONLY

2. Labels shall be affixed to all waste bags or waste wrapped in polyethylene plastic. Labels shall be printed in large, bold letters on a contrasting background and used in accordance with the requirements of 29 CFR 1910.1200(f) of OSHA's Hazard Communication standard, and shall contain the following information:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

3.02 AIR CIRCULATION AND FILTRATION SYSTEM

A. Diminished pressure inside the regulated area shall be maintained 24 hours per day for the duration of the project. Duration shall be considered from the time critical barriers are installed through the time acceptable final air clearance results are obtained.

B. A high efficiency particulate absolute (HEPA) filtration system shall be used. The HEPA system shall be capable of collecting and retaining 99.97 per cent of airborne particles with an aerodynamic diameter of .3 microns or larger.

C. Diminished pressure inside the regulated area shall be maintained with the use of HEPA filtered machines, shall be designed to move air away from the worker's breathing zone, shall exhaust directly to the exterior of the building, and shall have the capacity to produce at a minimum four air changes per hour.

3.03 INSTALLATION OF CRITICAL BARRIERS

A. Enclose the work area by installing critical barriers over all windows, doorways, drains, ducts, grills, grates, diffusers, skylights, etc. Critical barriers shall consist of at least 4-mil thick polyethylene plastic sheeting secured in place with duct tape and/or spray adhesive.

B. Contractor shall decontaminate and remove all movable objects from the regulated area and dispose as construction debris. Non-movable objects remaining in the regulated area shall be wet cleaned and HEPA vacuumed and covered with at least one layer of 4-mil polyethylene plastic sheeting secured in place with duct tape and/or spray adhesive.

C. During removal of windows with window pane glaze intact, install a single layer of 4-mil polyethylene plastic sheeting over the window opening from the interior of the building. Secure plastic sheeting in place using duct tape and/or spray adhesive.

3.04 STOP WORK

A. If critical barriers fail or are breached in any manner, stop work immediately. Do not start work until the situation has been corrected and written authorization obtained from the Owner's Representative.

3.05 REMOVAL OF BLACK HVAC DUCT AND PIPE MASTIC

A. After establishing a diminished pressure enclosure, the following techniques shall be used to remove duct and pipe mastic from fiberglass duct or pipe insulation or metal duct.

1. Sufficiently wet material to be removed. If the jacket is in place, it may be necessary to wet the jacket on the surface and then carefully cut open the jacket to allow for continuing the wetting process. At no time shall friable ACM be removed without thorough wetting.

2. Insulation shall be removed from the piping, fittings and vessels and immediately placed in an asbestos disposal bag. The insulation and jacket shall not be allowed to accumulate outside of disposal bags.

3. If insulation is found to be not sufficiently wet, stop removal activities and re-wet the are.

B. Once all insulation has been removed, the remaining surface shall be cleaned of any visible debris by using a soft bristle brush and amended water. The use of disposable rags may aid in this effort.

A. Asbestos containing mastic located on metal duct may require the use of a mastic remover to aid in this process. If a mastic remover is used, apply in accordance with manufacturers literature. The area shall be cleaned with amended water after use of any mastic remover.

D. The asbestos-containing mastic may be removed by removing the duct or pipe itself in whole sections. It this process is used, the duct and pipe sections must be placed in bags or wrapped in polyethylene sheeting and taped into a cocoon. If removed in this manner, the entire duct must be treated as ACM.

E. All waste materials, including unusable brushed, mops and cleaning rags used to remove ACM, shall be disposed of as contaminated waste.

3.06 REMOVAL OF FLOOR TILE AND MASTIC

A. Contractor shall be required to remove all identified floor tile, cove base and mastic from the structure. Some of the material may be covered with carpet. This is identified on the drawings. All floor tile to be removed will be notified as "friable removal" to the State of Georgia and the appropriate fee paid.

B. All floor tile and mastic shall be removed while wet and the work area shall be maintained under diminished pressure at all times prior to project clearance. Critical barriers will be utilized to maintain diminished pressure.

C. All floor tile and mastic shall be adequately wetted with amended water and double-bagged in 6-mil polyethylene plastic disposal bags. Bags shall be sealed with duct tape, labeled as described elsewhere in this section, and removed from the regulated area at the end of each day's work shift.

D. Diminished pressure shall be maintained at all times until final inspection and approval of the work area by the consultant.

3.07 REMOVAL OF DRYWALL/JOINT COMPOUND

A. When specified, all drywall/joint compound shall be removed from the building. This material shall be removed as friable asbestos-containing material.

B. The material shall be adequately wet prior to disturbance. The material shall be removed in pieces small enough to safely handle and package for disposal.

C. Diminished pressure shall be maintained at all times until final inspection and approval of the work area by the Consultant.

3.08 REMOVAL OF THERMAL SYSTEM INSULATION (TSI) ELBOWS AND FITTINGS

A. Elbows and fittings shall be removed using wet methods.

a. Wet TSI with a fine mist of amended water or removal encapsulant. Allow time for amended water to saturate material to the substrate. Do not over saturate to cause dripping. Scrape material from substrate. Remove material in manageable quantities.

b. If using amended water, mist surface continuously during work process. If using removal encapsulant, follow manufacturer's instructions.

c. Remove residue remaining on substrate after scraping, using a stiff nylon bristled hand brush. If removal encapsulant is used, remove residue before encapsulant is allowed to dry. Keep substrate moist during cleaning. Do not allow to dry.

d. Place material in pre-labeled disposal bags while still wet. Wipe bags clean and place in a second disposal bag and move to the equipment wash down station. Do not permit large quantities of material to collect before bagging, and do not allow material to dry.

B. Contractor may elect to remove pipe and pipe insulation intact. If this method is selected, the following shall apply:

a. Wet TSI with a fine mist of amended water or removal encapsulant. Allow time for amended water to saturate material to the substrate. Do now over saturate to cause dripping.

b. Cut pipe or ductwork in lengths that can be easily handled by two workers (approximately 6 feet to 8 feet). Wrap the entire length of pipe in 6-mil polyethylene plastic sheeting and seal with duct tape and/or spray adhesive. Ensure ends are secured to prevent water leaks. Candy-stripe the entire length of pipe.

c. Wrap a second layer of 6-mil polyethylene plastic sheeting and seal with duct tape and/or spray adhesive. Again, ensure ends are securely sealed and candy stripe the entire length of pipe. Affix labels as described elsewhere in this section.

C. Diminished pressure shall be maintained at all times until final inspection and approval of the work area by the consultant.

3.09 REMOVAL OF TSI PIPE ELBOWS/FITTINGS BY GLOVEBAG METHOD

A. All applicable OSHA requirements and glove bag manufacturer's recommendations shall be met during glove bagging operations. For removal of pipe elbows and joints, a regulated area shall be established on the grounds surrounding the pipe area in the facility by erecting barriers extending a minimum of fifteen (15) feet from the center of the glove bag area. Warning tape and caution signs shall be used which will alert unprotected individuals and prevent them from accidentally entering the regulated area.

B. Barriers shall be erected using two (2) strands of warning tape between stanchions: the first tape shall be twelve (12) inches from the ground; the second tape shall be no more than forty-eight (48) inches from the ground. Caution signs shall be suspended between the strands of warning tape no more than ten (10) feet apart. Warning signs shall read as follows:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA
AUTHORIZED PERONNEL ONLY

C. All movable objects will be removed from the regulated area. Pre-clean objects remaining in the regulated area using a HEPA vacuum and/or wet cleaning methods. Cover all objects with at least one layer of 4-mil polyethylene plastic sheeting secured in place with duct tape and/or spray adhesive.

D. Seal one layer of 6-mil polyethylene plastic sheeting to the floor directly below the elbow/joint to be removed. Sheeting shall extend a minimum six feet to either side of the center point. This layer of plastic shall be secured to prevent displacement by wind.

E. Mix the surfactant with water in the garden sprayer, following the manufacturer's directions.

F. Check closely the integrity of the glove bag to be used. Check all seams, gloves, sleeves, and glove openings. OSHA requires the bottom of the bag to be seamless.

G. Attach glove bag with required tools per manufacturer's instructions.

H. Using the smoke tube and aspirator bulb, test 100% of glove bags by placing the tube into the water porthole (two-inch opening to glove bag), and fill the bag with smoke and squeeze it. If leaks are found, they should be taped closed using duct tape and the bag should be retested with smoke.

I. Insert the wand from the water sprayer through the water porthole.

J. Insert the hose end from a HEPA vacuum into the upper portion of the glove bag.

K. Wet and remove the pipe insulation.

L. When the work is complete, spray the upper portion of the bag and clean-push all residue into the bottom of the bag with the other waste material. Be very thorough. Use adequate water.

M. Put all tools, after washing them off in the bag, in one of the sleeves of glove bag and turn it inside out, drawing it outside of the bag. Twist the sleeve tightly several times to seal it and tape it several tight turns with duct tape. Cut through the middle of the duct tape and remove the sleeve. Put the sleeve in the next glove bag or put it in a bucket of water to decontaminate the tools after cutting the sleeve open.

N. Turn on the HEPA vacuum and collapse the bag completely. Remove the vacuum nozzle, seal the hole with duct tape, twist the bag tightly several times in the middle, and tape it to keep the material in the bottom during removal of the glove bag from the pipe.

O. Slip a disposal bag over the glove bag (still attached to the pipe). Remove the tape securing the ends, and slit open the top of the glove bag and carefully fold it down into the disposal bag. Double bag and gooseneck waste materials.

P. If the glove bag is breached in any manner that could allow the passage of dust onto interior parts of the facility, the affected area shall be added to the regulated area and decontaminated as described elsewhere in these procedures.

3.06 REMOVAL OF CEILING TEXTURE

A. All textured surface treatment shall be removed from the building. This material shall be removed as friable asbestos-containing material.

B. The coating shall be ad equately wet prior to disturbance. The material shall be removed in pieces small enough to safely handle and package for disposal. It shall be acceptable to remove the material while applied to the sheet rock and dispose of all as ACM.

C. Scraping and/or use of a stiff bristle brush may be used to accomplish removal. Wire brushes and pressure washers are not to be used.

D. Diminished pressure shall be maintained at all times until final inspection and approval of the work area by the consultant.

3.07 REMOVAL OF ASBESTOS CEMENT PANELS

A. When specified on the drawings, all asbestos cement panels (sometime manufactured as Transite™) shall be removed from the building. This material shall be removed intact as much as practical. If broken for removal purposes, this shall be removed as friable asbestos containing material.

B. The asbestos cement board shall be adequately wet prior to disturbance. The material shall be removed in complete pieces as installed if possible.

C. Scraping and/or use of a stiff bristle brush may be used to accomplish clean-up when the panel is removed. Wire brushes and pressure washers are not to be used.

D. When removal is accomplished on the inside of the building, diminished pressure shall be maintained at all times until final inspection and approval of the work area by the consultant. If removal is accomplished on the exterior of the building, drop clothes and barriers shall be utilized to prevent contamination of any surrounding areas.

END OF SECTION

SECTION 022084
DISPOSAL OF ASBESTOS-CONTAINING MATERIAL

PART 1 - GENERAL

1.01 DESCRIPTION OF THE WORK

A. This section describes the disposal of asbestos-containing material. Disposal includes packaging in properly labeled, leak-tight containers, transportation to and depositing in an approved landfill licensed to accept asbestos-containing waste.

1.02 SUBMITTALS

A. Submit the following to the Owner for review. Do not start work until these submittals are returned with the Owner's action stamp or other form of written approval indicating that the submittal is returned for unrestricted use.

1. Copy of state or local license for waste hauler.
2. Name and address of landfill where asbestos-containing waste materials are to be buried. Include contact person and telephone number.
3. Sample Chain of Custody Form and Waste Shipment Record.

PART 2 - PRODUCTS:

2.01 DISPOSAL BAGS

A. Provide 6-mil, leak-tight polyethylene bags labeled with three labels with text as follows:

First label (29 CFR 1926.1101)

CAUTION
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

Second label (49 CFR Parts 171 and 172)

ASBESTOS
DIVISION 9
NA 2212
RQ

Third label — Provide in accordance with 40 CFR Part 61, Subpart M, November 20, 1990, a label identifying the generator of the waste and the location at which the waste was generated.

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with SECTION 02081 - REMOVAL OF ASBESTOS-CONTAINING MATERIALS during all phases of this work.

B. All waste is to be hauled by a waste hauler with all required licenses from all state and local authorities with jurisdiction. Mark vehicles used to transport asbestos waste with a sign 20 inches by 14 inches with text as follows:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA
AUTHORIZED PERONNEL ONLY

C. Load all asbestos-containing waste material in disposal bags, leak-tight drums, or properly lined and labeled containers.

D. Protect interior of truck cargo area and/or dumpster by lining the interior of the truck cargo area and/or dumpster with at least one layer of 6-mil polyethylene plastic sheeting held in place with duct tape and/or spray adhesive.

E. Carefully load containerized waste in fully enclosed dumpsters, trucks or other appropriate vehicles for transport. Exercise care before and during transport to insure that no unauthorized persons have access to the material.

F. Do not store containerized materials inside the regulated area. Take containers from the regulated area directly to a sealed truck cargo area and/or dumpster. Keep truck cargo area and/or dumpster locked to prevent access by unauthorized personnel.

G. Do not transport bagged or drummed disposal materials on open trucks. Label drums with same warning labels as bags. Uncontaminated drums may be reused. Treat drums that have been contaminated as asbestos-containing waste and dispose of in accordance with this specification.

H. At a disposal site, sealed plastic bags or drums may be carefully unloaded from the truck. Do not throw bags or drums to the ground. If bags or drums are broken or damaged, return all waste to the work site for repackaging. Clean interior of the truck cargo area and/or dumpster using wet methods and HEPA vacuum. Replace polyethylene plastic sheeting after wet wiping and HEPA vacuuming.

I. Retain receipts from landfill or processor for disposed materials.

J. At completion of the project, submit copies of waste manifests, chain of custody forms, and landfill receipts to the Consultant.

END OF SECTION

SECTION 024119
SELECTIVE DEMOLITION

PART 1 - GENERAL

RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
B. See Spec Section 028213 for Asbestos Abatement requirements.

DESCRIPTION OF WORK:

Extent of selective demolition work is indicated on drawings.

Type of selective demolition work required includes but is not limited to the selective removal and subsequent offsite disposal of the following:

Portions of existing building, rough framing, walls, flooring, windows, HVAC equipment, light fixtures, plumbing fixtures, and other miscellaneous items indicated on drawings to be removed and as required to accommodate new construction.

Removal work specified elsewhere:

Cutting non-structural concrete floors and masonry walls for underground piping and ducts, and for above grade piping, ducts, and conduit is included with the work of the respective mechanical and electrical Divisions 15 and 16 specification sections.

Relocation of pipes, conduits, ducts, other mechanical and electrical work are specified for respective trades.

NO DEMOLITION WORK SHALL PROCEED UNTIL ASBESTOS ABATEMENT IS COMPLETE.

SUBMITTALS:

Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's Representative for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection.

JOB CONDITIONS:

Occupancy: Building residents will be completely vacated from the area to be renovated and where selective demolition will occur. Residents will be continuously occupying floors of the building immediately above areas of selective demolition. **Continual emergency egress access from the building shall be provided and shall be maintained for the entire duration of the project. Temporary steps, barricades, railings, etc. shall be constructed if necessary to allow for emergency exit access.** Conduct selective demolition work in manner that will minimize disruption of Owner's normal operations. Provide advance notice to Owner of demolition activities that will impact Owner's normal operations.

Condition of Structures: The building was constructed in 1965 and some elements may have deteriorated. Owner assumes no responsibility for actual condition of items or structures to be demolished.

Partial Demolition and Removal: All material and equipment from demolition shall be the property of the Owner until his acceptance or refusal upon inspection of the material at which time the refused material becomes the property of the Contractor and shall be removed from the job site completely. Special care shall be taken in the removal of any specific items as noted on the Drawings that are to be reused in this project or reused by the Owner at a later date.

Storage of removed items on site will not be permitted.

Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.

Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain. Contractor shall be responsible for the structural design of all protective devices.

Contractor shall provide, install, and otherwise be responsible for any and all materials, equipment, tools, devices, and/or apparatus required to protect and maintain existing structures in a stationary and safe condition.

Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

Construct temporary insulated solid dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed.

Remove protections at completion of work.

Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

INSPECTION:

Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing conditions to structure surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Owner's Representative prior to starting work.

PREPARATION:

Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

Cease operations and notify the Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.

Locate, identify, stub off and disconnect utility services that are not indicated to remain.

Provide by-pass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shut-down of service is necessary during change-over.

DEMOLITION:

Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.

For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.

Completely fill below-grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel or sand, free of trash and debris, stones over 6" diameter, roots or other organic matter.

If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail.

DISPOSAL OF DEMOLISHED MATERIALS:

Remove debris, rubbish and other materials resulting from demolition operations from building site. Transport and legally dispose of materials refused by the Owner off site.

If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.

Burning of removed materials is not permitted on project site.

CLEAN-UP AND REPAIR:

Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

SECTION 032000
CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.2 RELATED REQUIREMENTS

A. Section 042000 - Unit Masonry: Reinforcement for masonry.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for additional unit price requirements.

B. Bar Reinforcement: By the ton (metric ton). Includes reinforcement, placement, and accessories.

C. Welded Wire Reinforcement: By the square foot (square m). Includes welded wire reinforcement, placement, and accessories.

1.4 REFERENCE STANDARDS

A. ACI 301 - Specifications for Concrete Construction 2020.

B. ACI 318 - Building Code Requirements for Structural Concrete 2019, with Errata (2021).

C. ACI SP-66 - ACI Detailing Manual 2004.

D. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement 2019.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.

F. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire 2019.

G. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement 2019, with Editorial Revision.

H. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement 2016.

I. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement 2019.

J. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars 2019.

K. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement 2019, with Editorial Revision (2020).

L. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement 2016.

M. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2018a.

N. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars 2021.

O. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification 2014 (Amended 2015).

P. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel 2018.

Q. CRSI (DA4) - Manual of Standard Practice 2009.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
   1. Plain billet-steel bars.
   2. Unfinished.
   3. Galvanized in accordance with ASTM A767/A767M, Class I.
   4. Continuously galvanized in accordance with ASTM A1094/A1094M.
   5. Epoxy coated in accordance with ASTM A775/A775M.

B. Reinforcing Steel: ASTM A706/A706M, deformed low-alloy steel bars.
   1. Unfinished.
   2. Galvanized in accordance with ASTM A767/A767M, Class I.
   3. Continuously galvanized in accordance with ASTM A1094/A1094M.
   4. Epoxy coated in accordance with ASTM A775/A775M.

C. Reinforcing Steel Mat: ASTM A704/A704M, using ASTM A615/A615M, Grade 40 (40,000 psi) (280 MPa) steel bars or rods, unfinished.

D. Stirrup Steel: ASTM A1064/A1064M steel wire, unfinished.

E. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
   1. Form: Flat Sheets.
   2. WWR Style: 4 x 8-W6 x W10 (102 x 203-MW39 x MW65).

F. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide stainless steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.

2.2 RE-BAR SPLICING:

A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.
   1. Products:
      a. Dayton Superior Corporationwww.daytonsuperior.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

B. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for connecting dowels; capable of developing full steel reinforcing design strength in tension and compression.
   1. Products:
      a. Dayton Superior Corporationwww.daytonsuperior.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

C. Taper Tie Hole Plug: Mechanical device for plugging tie holes; anchors optional flush or recessed grout.
   1. Products:
      a. Dayton Superior Corporation www.daytonsuperior.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is not permitted.

C. Welding of reinforcement is permitted only with the specific approval of Architect. Perform welding in accordance with AWS D1.4/D1.4M.
   1. Galvanized Reinforcement: Clean surfaces, weld and re-protect welded joint in accordance with CRSI (DA4).

D. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.

E. Locate reinforcing splices not indicated on drawings at point of minimum stress.
   1. Review locations of splices with Architect.

PART 3 - EXECUTION

2.4 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Maintain concrete cover around reinforcing as follows:
   1. Beams: [1.5"] inch ([____] mm)
   2. Supported Slabs and Joists: [3/4" #3 to #11 bar] inch ([____] mm).
   3. Column Ties: [1.5"] inch ([____] mm).
   4. Walls (exposed to weather or backfill): [3/4" #3 to #11 bar inch] inch ([____] mm).
   5. Footings and Concrete Formed Against Earth: 3 inch ([____] mm).
   6. Slabs on Fill: [2"] inch ([____] mm).

E. Comply with applicable code for concrete cover over reinforcement.

F. Bond and ground all reinforcement to requirements of Section 260526.

2.5 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 014000 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

2.6 SCHEDULES

A. Reinforcement For Superstructure Framing Members: Deformed bars, unfinished.

B. Reinforcement For Foundation Wall Framing Members and Slab-on-Grade: Deformed bars and welded wire reinforcement, galvanized finish.

C. Reinforcement For Parking Structure Framing Members: Deformed bars, epoxy coated finish.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 - PRODUCTS

1.1 FORMWORK

A. Comply with requirements of Section 031000.

B. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.

C. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
   2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
   3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
   4. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches (38 mm) of concrete surface.

1.2 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.
   3. Finish: Galvanized in accordance with ASTM A767/A767M, Class I, unless otherwise indicated.
   4. Finish: Epoxy coated in accordance with ASTM A775/A775M, unless otherwise indicated.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
   1. Form: Coiled Rolls.
   2. WWR Style: 4 x 8-W6 x W10 (102 x 203-MW39 x MW65).

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.

1.3 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.

B. Blended, Expansive Hydraulic Cement: ASTM C845/C845M, Type K.
   1. Products:
      a. CTS Cement Manufacturing Corporation; Type K Cement: www.ctscement.com/#sle.
      b. Euclid Chemical Company; EUCON MSA: www.euclidchemical.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

C. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.

D. Lightweight Aggregate: ASTM C330/C330M.

E. Fly Ash: ASTM C618, Class C or F.

F. Calcined Pozzolan: ASTM C618, Class N.

G. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

H. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
   1. Concentration: Base dosage rates on weight of Portland cement, fly ash, silica fume, and other cementitious materials but not aggregate or sand.
   2. Packaging: If pigments are to be added to mix at site, furnish pigments in premeasured disintegrating bags to minimize job site waste.
   3. Color(s): As indicated on drawings.
   4. Color(s): To match Architect's sample(s) when incorporated into specified mix design(s).

I. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

J. Structural Fiber Reinforcement: ASTM C1116/C1116M.
   1. Fiber Length: 2.0 inch (50.66 mm), nominal.
   2. Fiber Type: Alkali-resistant synthetic.
   3. Products:
      a. Euclid Chemical Company: www.euclidchemical.com/#sle.
      b. Fibermesh; Enduro Mirage: www.fibermesh.com/#sle.
      c. Fibermesh; Enduro Prime: www.fibermesh.com/#sle.
      d. Fibermesh; Fibermesh 650: www.fibermesh.com/#sle.
      e. Forta Corporation; FORTA-FERRO (2-1/4"): www.forta-ferro.com/#sle.
      f. GCP Applied Technologies; STRUX 90/40: www.gcpat.com/#sle.
      g. GCP Applied Technologies; STRUX BT50: www.gcpat.com/#sle.
      h. Substitutions: See Section 016000 - Product Requirements.

K. Blended Fiber Reinforcement: ASTM C1116/C1116M, engineered blend of two or more sizes of reinforcing fibers.
   1. Fiber Type: Alkali-resistant synthetic.
   2. Products:
      a. Fibermesh; Novomesh 950: www.fibermesh.com/#sle.
      b. Master Builders Solutions; MasterFiber MAC 360 FF: www.master-builders-solutions.com/en-us/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

1.4 ADMIXTURES

A. Chemical Admixture:
   1. Manufacturers:
      a. {CH#18561}
      b. Substitutions: See Section 016000 - Product Requirements.

B. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

C. Air Entrainment Admixture: ASTM C260/C260M.

D. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

E. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
   1. Products:
      a. Euclid Chemical Company; PLASTOL 6420: www.euclidchemical.com/#sle.
      b. {CH#17771}
      c. Substitutions: See Section 016000 - Product Requirements.

F. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
   1. Products:
      a. Euclid Chemical Company; ACCELGUARD 80: www.euclidchemical.com/#sle.
      b. {CH#17775}

c. Substitutions: See Section 016000 - Product Requirements.

G. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
1. Provide pigmented type, with ASTM C979/C979M inorganic pigments.
2. Products:
a. Substitutions: See Section 016000 - Product Requirements.

H. Accelerating Admixture: ASTM C494/C494M Type C.
1. Products:
a. W. R. Meadows, Inc; Hydraset: www.wrmeadows.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

I. Retarding Admixture: ASTM C494/C494M Type B.
1. Products:

J. Water Reducing Admixture: ASTM C494/C494M Type A.

K. Shrinkage Reducing Admixture:
1. ASTM C494/C494M, Type S.
2. Products:
a. Euclid Chemical Company; Eucon SRA Floor: www.euclidchemical.com/#sle.
b. Euclid Chemical Company; Eucon SRA-XT: www.euclidchemical.com/#sle.
c. GCP Applied Technologies; Eclipse 4500: www.gcpat.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

L. Shrinkage Compensating Admixture: For on site production of concrete with ASTM C845/C845M, Type K cement.

M. Shrinkage Compensating Admixture with Fiber Reinforcement: For on site production of concrete with ASTM C845/C845M, Type K cement with integral fiber reinforcement.
1. Products:
a. CTS Cement Manufacturing Corporation; System K: www.ctscement.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

N. Corrosion Inhibiting Admixture:
1. ASTM C494/C494M, Type C.
2. ASTM C1582/C1582M.
3. Products:
a. Euclid Chemical Company; EUCON CIA: www.euclidchemical.com/#sle.
b. GCP Applied Technologies; DCI: www.gcpat.com/#sle.
c. GCP Applied Technologies; DCI S: www.gcpat.com/#sle.
d. Hycrete, Inc; X1000: www.hycrete.com/#sle.
e. Substitutions: See Section 016000 - Product Requirements.

O. Microbiologically-Induced Corrosion Inhibiting Admixture: Resists growth of bacteria and fungi on or inside concrete.
1. Products:
a. ConShield Technologies, Inc; ConShield HD: www.conshield.com/#sle.
b. Penetron; BioMIC: www.penetron.com/#sle.
c. Substitutions: See Section 016000 - Product Requirements.

P. Porosity Inhibiting Admixture (PIA): Liquid, inorganic admixture free of volatile organic compounds (VOCs) and reactive silicates. Closes capillary systems formed during concrete curing to reduce moisture vapor emission and transmission. Reduces alkali silicate reaction (ASR) and concrete shrinkage with no adverse effect on concrete properties or applied flooring.
1. Provide admixture in slabs to receive adhesively applied flooring or roofing.
2. Provide admixture in exterior slabs and decks.
3. Hydraulic Conductivity: 6 x 10 exp(-8) fps (1.8 x 10 exp(-8) cmps), minimum, when tested according to ASTM D5084.

4. Concrete Shrinkage Reduction at 28 Days: 75 percent, minimum, when compared to mix design without PIA and both tested according to ASTM C157/C157M.
5. ASR Reduction at 28 Days: 78 percent, minimum, when compared to mix design without PIA and both tested according to ASTM C1260.
6. Includes integral biocide.
7. Products:
    a. Barrier One Concrete Admixtures; PIA: www.barrierone.com/#sle.
    b. Substitutions: See Section 016000 - Product Requirements.

Q. Moisture Vapor Reducing Admixture (MVRA): Liquid, inorganic admixture free of volatile organic compounds (VOCs). Closes capillary systems formed during concrete curing to reduce moisture vapor emission and transmission. Reduces concrete shrinkage with no adverse effect on concrete properties or applied flooring.
1. Provide admixture in slabs to receive adhesively applied flooring or roofing.
2. Provide admixture in concrete for elevator pits, retaining walls, water-retaining structures, underground structures, roads, dams, and bridges.
3. Concrete Shrinkage Reduction at 28 Days: 35 percent, minimum, when compared to mix design without MVRA and both tested according to ASTM C157/C157M.
4. VOC Content: Zero.
5. Products:
    a. AVECS, LLC; PRO-ACT: www.avecs.build/#sle.
    b. Barrier One Concrete Admixtures; MVRA-CPS: www.barrierone.com/#sle.
    c. Hycrete, Inc www.hycrete.com/#sle.
    d. ISE Logik Industries, Inc; MVRA 900: www.iselogik.com/#sle.
    e. Specialty Products Group; Vapor Lock 20/20: www.spggogreen.com/#sle.
    f. Substitutions: See Section 016000 - Product Requirements.

R. Waterproofing Admixture: Admixture formulated to reduce permeability to liquid water, with no adverse effect on concrete properties.
1. Admixture Composition: Crystalline, functioning by growth of crystals in capillary pores.
2. Admixture Composition: Hydrophobic polymer waterproofing and corrosion inhibitor, functioning by closing concrete pores and chemical bonding.
3. Permeability of Cured Concrete: No measurable leakage when tested in accordance with COE CRD-C 48 at 200 psi (1.38 MPa); provide test reports.
4. Potable Water Contact Approval: National Science Foundation (NSF) certification for use on structures holding potable water, based on testing in accordance with NSF 61 and NSF 372
5. Products:
    a. Aquafin, Inc www.aquafin.net/#sle.
    b. Barrier One Concrete Admixtures; WPX Water Proofer: www.barrierone.com/#sle.
    c. ConShield Technologies, Inc; Crystal X: www.conshield.com/#sle.
    d. Euclid Chemical Company; Eucon Vandex AM-10: www.euclidchemical.com/#sle.
    e. Hycrete, Inc; W500: www.hycrete.com/#sle.
    f. ISE Logik Industries, Inc; CWPA 800: www.iselogik.com/#sle.
    g. Kryton International, Inc; Krystol Internal Membrane (KIM): www.kryton.com/#sle.
    h. Penetron; PENETRON ADMIX SB: www.penetron.com/#sle.
    i. Specialty Products Group; Vapor Lock 20/21: www.spggogreen.com/#sle.
    j. W. R. Meadows, Inc; ADI-CON CW Plus: www.wrmeadows.com/#sle.
    k. Xypex Chemical Corporation; XYPEX Admix C-500: www.xypex.com/#sle.
    l. Substitutions: See Section 016000 - Product Requirements.

S. Integral Hardening Admixture: Dry powder added to concrete during batching.
1. Products:
    a. Kryton International, Inc; HARD-CEM: www.kryton.com/#sle.
    b. Substitutions: See Section 016000 - Product Requirements.

1.5 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:
   1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.
   2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   3. Products:
      a. Henry Company; Moistop Ultra 15: www.henry.com/#sle.
      b. Inteplast Group; Barrier-Bac VB-250: www.barrierbac.com/#sle.
      c. Inteplast Group; Barrier-Bac VB-350: www.barrierbac.com/#sle.
      d. ISI Building Products; Viper II Platinum 8-mil (Class A): www.viper2.com/#sle.
      e. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com/#sle.
      f. Poly-America; Husky Yellow Guard Class A 20-mil Vapor Barrier: www.yellowguard.com/#sle.
      g. Stego Industries, LLCwww.stegoindustries.com/#sle.
      h. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils (0.38 mm): www.wrmeadows.com/#sle.
      i. Substitutions: See Section 016000 - Product Requirements.

B. Termite-Resistant Vapor Barrier Sheet: Plastic sheet complying with ASTM E1745, Class C; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs, and for exclusion of subterranean termites.
   1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, prefabricated boots, etc., for sealing seams and penetrations.
   2. Products:
      a. Stego Industries, LLC; Pango Wrap with Pango Tape: www.stegoindustries.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

C. Termite-Excluding Underslab Barrier and Waterproofing Membrane: Composite sheet of polyethylene film, termite-excluding barrier sealant, and non-woven polypropylene fabric.
   1. Total Thickness: 95 mils (0.095 inch) (2.4 mm).
   2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
   3. Water Vapor Permeance: 0.03 perm (1.7 ng/(Pa s sq m)), maximum, when tested in accordance with ASTM E96/E96M.
   4. Accessory Products: Manufacturer's recommended flexible sealant tape, adhesive, mastic, etc., for sealing seams and penetrations.
   5. Products:
      a. Substitutions: See Section 016000 - Product Requirements.

D. Insulated Underslab Vapor Retarder: Multi-layer product of high density closed-cell foam and high density polyethylene bubble sandwiched between outer layers of aluminum-reinforced polyethylene or equivalent, stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
   1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   2. Products:
      a. Substitutions: See Section 016000 - Product Requirements.

E. Underslab Waterproofing and Vapor Retarder: Semi-rigid bituminous membrane, seven-ply, complying with ASTM E1993/E1993M.
   1. Composition: Weather-resistant coated, permanently bonded bituminous core board composed of an inner core, suspended and sealed within high melt point asphalt-impregnated felt, with glass mat liner and polyethylene anti-stick sheet.
   2. Permeance: 0.002 perms (0.1 ng/(Pa s sq m)), maximum.
   3. Tensile Strength: 140 pounds-force/inch (24.5 kN/m), minimum.

4. Puncture Resistance: 90 pounds-force (400 N), minimum, when tested in accordance with ASTM E154/E154M.
5. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
6. Products:
    a. W. R. Meadows, Inc; PRECON-Blindside/Underslab Membrane: www.wrmeadows.com/#sle.
    b. W. R. Meadows, Inc; PREMOULDED MEMBRANE VAPOR SEAL with PLASMATIC CORE: www.wrmeadows.com/#sle.
    c. Substitutions: See Section 016000 - Product Requirements.

F. Composite Underslab Vapor Retarder: Composite sheet of plastic film laminated with non-woven geotextile fabric and complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs.
1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
2. Products:
    a. Inteplast Group; Barrier-Bac VBC-350: www.barrierbac.com/#sle.
    b. Substitutions: See Section 016000 - Product Requirements.

G. Chemical Resistant Vapor Intrusion Retarder: Composite sheet of ethyl vinyl alcohol (EVOH) plastic film laminated with nonwoven geotextile fabric and complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs.
1. Accessory Products: As recommended by membrane manufacturer for sealing seams and penetrations.
2. Products:
    a. PRO Services, Inc; Geo-Seal EV40s: www.eproinc.com/#sle.

H. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Grout: Comply with ASTM C1107/C1107M.
2. Height Change, Plastic State; when tested in accordance with ASTM C827/C827M:
    a. Maximum: Plus 4 percent.
    b. Minimum: Plus 1 percent.
3. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch (13.7 MPa).
4. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch (13.7 MPa).
5. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch (48 MPa).
6. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch (48 MPa).
7. Products containing aluminum powder are not permitted.
8. Flowable Products:
    a. Dayton Superior Corporation www.daytonsuperior.com/#sle.
    b. Euclid Chemical Company; NS GROUT: www.euclidchemical.com/#sle.
    c. Five Star Products, Inc; Five Star Fluid Grout 100: www.fivestarproducts.com/#sle.
    d. Kaufman Products Inc; SureGrout: www.kaufmanproducts.net/#sle.
    e. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; DURAGROUT: www.laticrete.com/our-products/concrete-construction-chemicals/#sle.
    f. SpecChem, LLC; SC Precision Grout: www.specchemllc.com/#sle.
    g. SpecChem, LLC; SpecRock: www.specchemllc.com/#sle.
    h. W. R. Meadows, Inc; 588-10K: www.wrmeadows.com/#sle.
    i. W. R. Meadows, Inc; 1428 HP: www.wrmeadows.com/#sle.
    j. W. R. Meadows, Inc; CG-86: www.wrmeadows.com/#sle.
    k. W. R. Meadows, Inc; Speed-E-Roc: www.wrmeadows.com/#sle.
    l. Substitutions: See Section 016000 - Product Requirements.
9. Low-Slump, Dry Pack Products:

a. Euclid Chemical Company; DRY PACK GROUT: www.euclidchemical.com/#sle.
b. Dayton Superior Corporation; [_____]: www.daytonsuperior.com/#sle.
c. Five Star Products, Inc; Five Star Grout: www.fivestarproducts.com/#sle.
d. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; Duragrout: www.lmcc.com/#sle.
e. SpecChem, LLC; SC Multipurpose Grout: www.specchemllc.com/#sle.
f. W. R. Meadows, Inc; PAC-IT: www.wrmeadows.com/#sle.
g. Substitutions: See Section 016000 - Product Requirements.

I. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.
1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
a. Maximum Height Change: Plus 4 percent.
b. Minimum Height Change: Plus 1 percent.
2. Minimum Compressive Strength at 7 days, ASTM C579: 12,000 pounds per square inch (82.7 MPa).
3. Minimum Compressive Strength at 7 days, ASTM D695: 12,000 pounds per square inch (82.7 MPa).
4. Products:
a. Euclid Chemical Company; E3-DEEP POUR: www.euclidchemical.com/#sle.
b. Dayton Superior Corporationwww.daytonsuperior.com/#sle.
c. Five Star Products, Inc; Five Star DP Epoxy Grout: www.fivestarproducts.com/#sle.
d. Five Star Products, Inc; Five Star HP Epoxy Grout: www.fivestarproducts.com/#sle.
e. SpecChem, LLC; SpecPoxy Grout: www.specchemllc.com/#sle.
f. W. R. Meadows, Inc; REZI-WELD 3/2: www.wrmeadows.com/#sle.
g. Substitutions: See Section 016000 - Product Requirements.

J. Termite-Resistant Barrier Sealant: Solvent-based; single component, non-sag, non-skinning, non-hardening, non-bleeding; vapor-impermeable; intended for fully concealed applications.
1. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
2. Products:

K. Heavy Duty, Abrasion-Resistant Concrete Floor Topping:
1. Products:
a. Euclid Chemical Company; EucoFloor 202: www.euclidchemical.com/#sle.
b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; EMERYTOP 400: www.lmcc.com/#sle.
c. Substitutions: See Section 016000 - Product Requirements.

L. Architectural Concrete Floor Topping and Resurfacer:
1. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 6,500 pounds per square inch (45 MPa).
2. Compressive Strength: Minimum 5000 pounds per square inch (34.5 MPa), tested per ASTM C472.
3. Products:
a. CTS Cement Manufacturing Corporation; TRU Self-Leveling: www.ctscement.com/#sle.
b. CTS Cement Manufacturing Corporation; TRU PC Polished Concrete: www.ctscement.com/#sle.
c. SpecChem, LLC; SpecLevel PCT: www.specchemllc.com/#sle.
d. USG; Durock® PWT Pro Self-Leveling Topping: www.usg.com/#sle.
e. Substitutions: See Section 016000 - Product Requirements.

M. Self-Leveling Cementitious Concrete Floor Topping:
1. Minimum Compressive Strength at 28 Days, ASTM C1708/C1708M: 7,000 pounds per square inch (48 MPa).
2. Products:

a. LATICRETE International, Inc; LATICRETE SUPERCAP SC650-MC: www.laticrete.com/#sle.
b. LATICRETE International, Inc; NXT Level SP: www.laticrete.com/#sle.
c. Substitutions: See Section 016000 - Product Requirements.

N. Non-Shrink Epoxy Chocking Compound:
1. Products:
a. Dayton Superior Corporation; [_____] www.daytonsuperior.com/#sle.
b. Kaufman Products Inc; K Pro HP Grout: www.kaufmanproducts.net/#sle.
c. Substitutions: See Section 016000 - Product Requirements.

1.6 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
1. Products:
a. Euclid Chemical Company; AKKRO-7T: www.euclidchemical.com/#sle.
b. Kaufman Products Inc; SureBond: www.kaufmanproducts.net/#sle.
c. Kaufman Products Inc; SureWeld: www.kaufmanproducts.net/#sle.
d. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com/#sle.
e. W. R. Meadows, Inc; ACRY-LOK-: www.wrmeadows.com/#sle.
f. Substitutions: See Section 016000 - Product Requirements.

B. Epoxy Bonding System:
1. Complying with ASTM C881/C881M and of Type required for specific application.
2. Products:
a. Adhesives Technology Corporation www.atcepoxy.com/#sle.
b. CTS Cement Manufacturing Corporation; Ultra-Fast Anchoring Adhesive: www.CTScement.com/#sle.
c. CTS Cement Manufacturing Corporation; Fast Anchoring and Repair Adhesive: www.CTScement.com/#sle.
d. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com/#sle.
e. Euclid Chemical Company; DURALFLEX GEL: www.euclidchemical.com/#sle.
f. Euclid Chemical Company; DURALFLEX LV: www.euclidchemical.com/#sle.
g. Euclid Chemical Company; DURAL 452 GEL, DURAL 452 LV, or DURAL 452 MV: www.euclidchemical.com/#sle.
h. Dayton Superior Corporationwww.daytonsuperior.com/#sle.
i. Kaufman Products Inc; SurePoxy HM EPL: www.kaufmanproducts.net/#sle.
j. Kaufman Products Inc; SurePoxy HM Class B: www.kaufmanproducts.net/#sle.
k. Pecora; Dynapoxy Healer/Sealer: www.pecora.com/#sle.
l. Pecora; Dynapoxy Low-Mod Epoxy: www.pecora.com/#sle.
m. SpecChem, LLC; SpecPoxy 1000, SpecPoxy 2000, SpecPoxy 3000, or SpecPoxy 3000FS: www.specchemllc.com/#sle.
n. W. R. Meadows, Inc; Rezi-Weld Gel Paste, Rezi-Weld Gel Paste State, Rezi-Weld 1000: www.wrmeadows.com/#sle.
o. Substitutions: See Section 016000 - Product Requirements.

C. Acetate Bonding Agent: Non-redispersable polyvinyl acetate.
1. Products:
a. Larsen Products Corp; Weldcrete: www.larsenproducts.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

D. Silane Hybrid Anchoring System:
1. Complying with ASTM C881/C881M and of Type required for specific application.
2. Products:
a. Adhesives Technology Corporation www.atcepoxy.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

E. Waterproofing Admixture Slurry: Slurry coat of Portland cement, sand, and crystalline waterproofing additive, mixed with water in proportions recommended by manufacturer to achieve waterproofing at cold joints in concrete.

F. Waterstops: Rubber, complying with COE CRD-C 513.
   1. Configuration: As indicated on drawings.
   2. Size: As indicated on drawings.
   3. Products:
      a. Substitutions: See Section 016000 - Product Requirements.

G. Waterstops: Bentonite and butyl rubber.
   1. Configuration: As indicated on drawings.
   2. Size: As indicated on drawings.
   3. Products:
      a. CETCO, a division of Minerals Technologies Inc; WATERSTOP RX: www.mineralstech.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

H. Waterstops: Preformed mineral colloid strips, 3/8 inch (9 mm) thick, moisture expanding.
   1. Configuration: As indicated on drawings.
   2. Size: As indicated on drawings.
   3. Products:
      a. Substitutions: See Section 016000 - Product Requirements.

I. Waterstops, Chemical-Resistant: Extruded, thermoplastic, virgin rubber; no recycled or reclaimed material or pigments allowed.
   1. Chemical Resistance: Tested in accordance with ASTM D471.
   2. Configuration: As indicated on drawings.
   3. Size: As indicated on drawings.
   4. Products:
      a. BoMetals, Inc; [____]: www.bometals.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

J. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.
   1. Size: As indicated on drawings.
   2. Size: 1/2 inch (13 mm) throat, 1/2 inch (13 mm) deep.

K. Slab Isolation Joint Filler: 1/2 inch (13 mm) thick, height equal to slab thickness, with removable top section that will form 1/2 inch (13 mm) deep sealant pocket after removal.
   1. Material: ASTM D1751, cellulose fiber.
   2. Material: ASTM D1752, sponge rubber (Type I).
   3. Material: ASTM D8139, semi-rigid, closed-cell polypropylene foam.
   4. Material: Closed-cell, non-absorbent, compressible polymer foam in sheet form.
   5. Products:
      a. Nomaco, Inc; Nomaflex Expansion Joint Filler with Void Cap Option: www.nomaco.com/#sle.
      b. Nomaco, Inc; Fastflex Slab Isolation Joint Filler with Tear-Off Strip: www.nomaco.com/#sle.
      c. W. R. Meadows, Inc; Fiber Expansion Joint Filler with Snap-Cap: www.wrmeadows.com/#sle.
      d. W. R. Meadows, Inc; Deck-O-Foam Joint Filler with pre-scored top strip: www.wrmeadows.com/#sle.
      e. W. R. Meadows, Inc; Ceramar Joint Filler with Snap-Cap: www.wrmeadows.com/#sle.
      f. Substitutions: See Section 016000 - Product Requirements.

L. Termite-Excluding Slab Isolation Joint Filler: 1/2 inch (13 mm) thick, composite sheet of elastomeric membrane, embedded stainless steel termite-exclusion screen, adhesive on both sides, and a disposable, treated release sheet.
   1. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
   2. Stainless Steel Mesh: ASTM E11; opening size 0.018 inch (0.44 mm), maximum.
   3. Products:
      a. Substitutions: See Section 016000 - Product Requirements.

M. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.
   1. Products:
      a. W. R. Meadows, Inc; Speed-E-Joint: www.wrmeadows.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

N. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches (150 mm) on center; ribbed steel stakes for setting.
   1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
   2. Height: To suit slab thickness.
   3. Manufacturers:
      a. BoMetals, Incwww.bometals.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

O. Dowel Sleeves: Plastic sleeve for smooth, round, steel load-transfer dowels.
   1. Manufacturers:
      a. BoMetals, Inc: www.bometals.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

P. Plate Dowel System: Steel plate dowel and plastic dowel sleeve; with integral fasteners for attachment to formwork.
   1. Manufacturers:
      a. BoMetals, Inc www.bometals.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

1.7 CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
   1. Products:
      a. Dayton Superior Corporation www.daytonsuperior.com/#sle.
      b. Euclid Chemical Company ; EUCOBAR: www.euclidchemical.com/#sle.
      c. Kaufman Products Inc; VaporAid: www.kaufmanproducts.net/#sle.
      d. Nox-Crete Inc; Monofilm: www.nox-crete.com/#sle.
      e. SpecChem, LLC; SpecFilm Concentrate or SpecFilm: www.specchemllc.com/#sle.
      f. W. R. Meadows, Inc ; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.
      g. Substitutions: See Section 016000 - Product Requirements.

B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
   1. Product dissipates within 4 to 6 weeks.
   2. Provide product containing fugitive red dye.
   3. Products:
      a. Dayton Superior Corporation; [_____]: www.daytonsuperior.com/#sle.
      b. Euclid Chemical Company; COLOR-CRETE CURE AND SEAL VOC: www.euclidchemical.com/#sle.
      c. Kaufman Products Inc; Thinfilm 420 Resin Base: www.kaufmanproducts.net/#sle.
      d. Nox-Crete Inc; Res-Cure DH 100: www.nox-crete.com/#sle.
      e. SpecChem, LLC; SpecRez: www.specchemllc.com/#sle.

f. W. R. Meadows, Inc; 1100-Clear: www.wrmeadows.com/#sle.
g. Substitutions: See Section 016000 - Product Requirements.

C. Curing Agent, Water-Cure Equivalent Type: Clear, water-based, non-film-forming, liquid-water cure replacement agent.
1. Comply with ASTM C309 standards for water retention.
2. Compressive Strength of Treated Concrete: Equal to or greater than strength after 14-day water cure when tested according to ASTM C39/C39M.
3. VOC Content: Zero.
4. Products:
a. Sinak Corporation; LithiumCure 1000: www.sinak.com/#sle.
b. Sinak Corporation; LithiumCure 2000: www.sinak.com/#sle.
c. Sinak Corporation; The Cure™ WCE: www.sinak.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

D. Curing and Anti-Spalling Compound: Boiled linseed oil compound.
1. Application: Use on roadway, bridge deck, parking deck, and ramps.
2. Products:
a. Dayton Superior Corporation www.daytonsuperior.com/#sle.
b. Euclid Chemical Company; LINSEED OIL TREATMENT: www.euclidchemical.com/#sle.
c. W. R. Meadows, Inc; Lin-Seal, Lin-Seal Emulsion, or Lin-Seal White: www.wrmeadows.com/#sle.

E. Wax Curing Compound: Water-based liquid, white pigmented, membrane-forming.
1. Products:
a. Dayton Superior Corporation www.daytonsuperior.com/#sle.
b. Euclid Chemical Company; KUREZ VOX WHITE PIGMENTED: www.euclidchemical.com/#sle.
c. Kaufman Products Inc; Thinfilm 445 Wax Base: www.kaufmanproducts.net/#sle.
d. Nox-Crete Inc; City Cure WW: www.nox-crete.com/#sle.
e. Substitutions: See Section 016000 - Product Requirements.

F. Resin Curing Compound: Solvent-based liquid, white pigmented, membrane-forming.
1. For use on exterior slabs. When slab will be painted, sealed, topped, or receive other applied finish, completely remove curing compound after curing is complete and before finish coatings are applied.
2. Comply with ASTM C309, Type 2, Classes A and B.
3. VOC Content: Less than 350 g/L.
4. Solids Content: 20 percent, minimum.
5. Products:
a. Dayton Superior Corporation www.daytonsuperior.com/#sle.
b. Euclid Chemical Company; KUREZ VOX WHITE PIGMENTED: www.euclidchemical.com/#sle.
c. Euclid Chemical Company: KUREZ DR-100: www.euclidchemical.com/#sle.
d. Euclid Chemical Company: KUREZ DR-VOX: www.euclidchemical.com/#sle.
e. Kaufman Products Inc; Thinfilm 450 Resin Base: www.kaufmanproducts.net/#sle.
f. Substitutions: See Section 016000 - Product Requirements.

G. Low-Solids, Non-Membrane-Forming, Silicate Curing Compound: Water-based, reactive silicate, non-membrane-forming liquid with red fugitive dye.
1. Products:
a. Nox-Crete Inc; Bro-Cure: www.nox-crete.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

H. Curing and Sealing Compound, Moisture Emission-Reducing, Membrane-Forming: Liquid, membrane-forming, clear sealer, for application to newly-placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.

1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
3. VOC Content: Less than 100 g/L.
4. Solids Content: 25 percent, minimum.
5. Products:
    a. Floor Seal Technology, Inc; VaporSeal 309 System: www.floorseal.com/#sle.
    b. Nox-Crete Inc; Cure & Seal 1200E: www.nox-crete.com/#sle.
    c. Substitutions: See Section 016000 - Product Requirements.

I. Curing and Sealing Compound, Moisture Emission-Reducing, Penetrating: Clear, water-based, non-film-forming curing agent; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission, moisture vapor emission, and alkalinity.
1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
2. Compressive Strength of Treated Concrete: Equal to or greater than strength after 28-day water cure when tested according to ASTM C39/C39M.
3. Chloride Ion Resistance of Treated Concrete: Equal to or greater than strength after 28-day water cure when tested according to ASTM C1202.
4. Comply with ASTM C309 and ASTM C1315 Type I Class A.
5. VOC Content: Zero.
6. UL GREENGUARD Gold certified.
7. Products:
    a. Sinak Corporation; VC5: www.sinak.com/#sle.
    b. Substitutions: See Section 016000 - Product Requirements.

J. Curing Compound, Non-dissipating: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C309.
1. Vehicle: Water-based.
2. Gloss: Low.
3. Solids by Mass: 15 percent, minimum.
4. VOC Content: OTC compliant.
5. Products:
    a. BRICKFORM; BRICKFORM Gem Cure and Seal 309 - 100 VOC: www.brickform.com/#sle.
    b. BRICKFORM; BRICKFORM Gem Cure and Seal 309 - 350 VOC: www.brickform.com/#sle.
    c. Kaufman Products Inc; Krystal 15 Emulsion: www.kaufmanproducts.net/#sle.
    d. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; Dress & Seal: www.lmcc.com/#sle.
    e. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; Dress & Seal WB: www.lmcc.com/#sle.
    f. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; Dress & Seal WB 30: www.lmcc.com/#sle.
    g. Nox-Crete Inc; Cure & Seal 100E: www.nox-crete.com/#sle.
    h. Nox-Crete Inc; Cure & Seal 150E: www.nox-crete.com/#sle.
    i. Nox-Crete Inc; Cure & Seal 309 LVOC: www.nox-crete.com/#sle.
    j. SpecChem, LLC; Cure and Seal 25: www.specchemllc.com/#sle.
    k. SpecChem, LLC; Cure and Seal WB: www.specchemllc.com/#sle.
    l. SpecChem, LLC; Cure and Seal WB 25: www.specchemllc.com/#sle.
    m. United Gilsonite Laboratories; DRYLOK Natural Look Sealer: www.ugl.com/#sle.
    n. W. R. Meadows, Inc; VOCOMP-20: www.wrmeadows.com/#sle.
    o. Substitutions: See Section 016000 - Product Requirements.

K. Curing and Sealing Compound, Low Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.

1. Vehicle: Water-based.
2. Solids by Mass: 25 percent, minimum.
3. VOC Content: OTC compliant.
4. Products:
    a. Clemons Concrete Coatings; Super Seal B-25: www.clemonsconcretecoatings.com/#sle.
    b. Euclid Chemical Company; DIAMOND CLEAR VOX: www.euclidchemical.com/#sle.
    c. Euclid Chemical Company; SUPER DIAMOND CLEAR: www.euclidchemical.com/#sle.
    d. Euclid Chemical Company; SUPER DIAMOND CLEAR 350: www.euclidchemical.com/#sle.
    e. Kaufman Products Inc; Krystal 25: www.kaufmanproducts.net/#sle.
    f. Kaufman Products Inc; Krystal 25 OTC, or Krystal 25 Emulsion: www.kaufmanproducts.net/#sle.
    g. Kaufman Products Inc; Krystal 30: www.kaufmanproducts.net/#sle.
    h. Kaufman Products Inc; Krystal 30 OTC, or Krystal 30 Emulsion: www.kaufmanproducts.net/#sle.
    i. W. R. Meadows, Inc; VOCOMP-25: www.wrmeadows.com/#sle.
    j. W. R. Meadows, Inc; CS-309 OTC: www.wrmeadows.com/#sle.
    k. W. R. Meadows, Inc; CS-309-25: www.wrmeadows.com/#sle.
    l. W. R. Meadows, Inc; CS-309-25 OTC: www.wrmeadows.com/#sle.
    m. W. R. Meadows, Inc; CS-309-30: www.wrmeadows.com/#sle.
    n. W. R. Meadows, Inc; CS-309-30 OTC: www.wrmeadows.com/#sle.
    o. W. R. Meadows, Inc; TIAH: www.wrmeadows.com/#sle.
    p. W. R. Meadows, Inc; TIAH OTC: www.wrmeadows.com/#sle.
    q. Substitutions: See Section 016000 - Product Requirements.

L. Curing and Sealing Compound, High Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
1. Vehicle: Solvent-based.
2. Solids by Mass: 25 percent, minimum.
3. VOC Content: Ozone Transport Commission (OTC) compliant.
4. Products:
    a. BRICKFORM; BRICKFORM Gem Cure and Seal 1315 - 350 VOC: www.brickform.com/#sle.
    b. BRICKFORM: BRICKFORM Gem Cure and Seal 1315 - 650 VOC: www.brickform.com/#sle.
    c. Concrete Sealers USA www.concretesealersusa.com/#sle.
    d. Kaufman Products Inc; Krystal 25: www.kaufmanproducts.net/#sle.
    e. Kaufman Products Inc; Krystal 25 OTC, or Krystal 25 Emulsion: www.kaufmanproducts.net/#sle.
    f. Kaufman Products Inc; Krystal 30: www.kaufmanproducts.net/#sle.
    g. Kaufman Products Inc; Krystal 30 OTC, or Krystal 30 Emulsion: www.kaufmanproducts.net/#sle.
    h. Nox-Crete Inc; Cure & Seal 250E: www.nox-crete.com/#sle.
    i. Nox-Crete Inc; Cure & Seal 1315A: www.nox-crete.com/#sle.
    j. SpecChem, LLC; Cure and Seal WB: www.specchemllc.com/#sle.
    k. SpecChem, LLC; Cure and Seal WB 25: www.specchemllc.com/#sle.
    l. SpecChem, LLC; Cure and Seal WB 30: www.specchemllc.com/#sle.
    m. SpecChem, LLC; Surface Shine WB: www.specchemllc.com/#sle.
    n. W. R. Meadows, Inc; VOCOMP-30: www.wrmeadows.com/#sle.
    o. W. R. Meadows, Inc; Decra-Seal: www.wrmeadows.com/#sle.
    p. W. R. Meadows, Inc; Decra-Seal OTC: www.wrmeadows.com/#sle.
    q. W. R. Meadows, Inc; Deck-O-Grip: www.wrmeadows.com/#sle.
    r. Substitutions: See Section 016000 - Product Requirements.

M. Moisture-Retaining Sheet: ASTM C171.

1. Curing paper, regular.
2. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch (0.102 mm).
3. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard (1.71 kg/sq m).
4. Products:
   a. Transhield, Inc; Topcure: www.transhield-usa.com/#sle.
   b. Substitutions: See Section 016000 - Product Requirements.

1.8 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
   1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

B. Proportioning Structural Lightweight Concrete: Comply with ACI 211.2 recommendations.
   1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

E. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard (0.89 kg per cu m), or as recommended by manufacturer for specific project conditions.

F. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch (27.6 MPa).
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
   4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
   5. Cement Content: Minimum 550 pounds per cubic yard ([___] kg per cu m).
   6. Water-Cement Ratio: Maximum 40 percent by weight.
   7. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
   8. Maximum Slump: 3 inches (75 mm).
   9. Maximum Aggregate Size: 5/8 inch (16 mm).

PART 2 - EXECUTION

2.1 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

2.2 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Prepare existing concrete surfaces to be repaired according to ICRI 310.2R, CSP 3.

E. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.

F. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.

G. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

H. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches (150 mm). Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
   1. Granular Fill Over Vapor Retarder: Cover vapor retarder with compactible granular fill as indicated on drawings. Do not use sand.
   2. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

2.3 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.

B. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

C. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

D. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

2.4 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Place concrete with shrinkage-compensating expansive component in accordance with ACI 223R-10.

D. Notify Architect not less than 24 hours prior to commencement of placement operations.

E. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

F. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

G. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

H. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

2.5 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
   1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.

E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch (5 mm) thick blade and cut at least 1 inch (25 mm) deep but not less than one quarter (1/4) the depth of the slab.

F. Contraction Joint Devices: Use preformed joint device, with top set flush with top of slab.

G. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

2.6 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.

B. Place required dividers, edge strips, reinforcing, and other items to be cast in.

C. Apply bonding agent to substrate in accordance with manufacturer's instructions.

D. Apply sand and cement slurry coat on base course, immediately prior to placing toppings.

E. Place concrete floor toppings to required lines and levels.
   1. Place topping in checkerboard panels not to exceed 20 feet (6 m) in either direction.

F. Screed toppings level, maintaining surface flatness of maximum 1:1000.

2.7 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. An independent testing agency, as specified in Section 014000, will inspect finished slabs for compliance with specified tolerances.

B. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch (6 mm) in 10 feet (3 m).
   2. Under Seamless Resilient Flooring: 1/4 inch (6 mm) in 10 feet (3 m).
   3. Under Carpeting: 1/4 inch (6 mm) in 10 feet (3 m).

C. Correct the slab surface if tolerances are less than specified.

D. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
   1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15, on-grade only.
   2. Under Raised Access Flooring: F(F) of 20; F(L) of 15, on-grade only.
   3. Under Thick-Bed Tile: F(F) of 20; F(L) of 15, on-grade only.
   4. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.
   5. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.
   6. Parking Structure: F(F) of 20; F(L) of 15, on-grade only.

E. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.

F. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

G. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

2.8 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch (6 mm) or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch (6 mm) or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
   2. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
   3. Cork Floated Finish: Immediately after form removal, apply grout with trowel or firm rubber float; compress grout with low-speed grinder, and apply final texture with cork float.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
   2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   3. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; take measures necessary to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to receive liquid hardeners, surfaces to receive dry-shake hardeners, surfaces to be polished, and all other exposed slab surfaces.
   4. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
   5. Chemical Hardener: See Section 033511.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

F. Concrete Polishing: See Section 033511.

2.9 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than seven days.
   2. High early strength concrete: Not less than four days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.

2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.
   b. Spraying: Spray water over floor slab areas and maintain wet.
   c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
3. Final Curing: Begin after initial curing but before surface is dry.
   a. Moisture-Retaining Sheet: Lap strips not less than 3 inches (75 mm) and seal with waterproof tape or adhesive; secure at edges.
   b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

2.10 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards (76 cu m) or less of each class of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

H. Slab Testing: Cooperate with manufacturer of specified moisture vapor reducing admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

I. Permeability Test: Test concrete with waterproofing admixture according to COE CRD-C 48.

2.11 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

2.12 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

2.13 SCHEDULE - CONCRETE TYPES AND FINISHES

A. Foundation Walls: 3,000 pounds per square inch (20.7 MPa) 28 day concrete, form finish with honeycomb filled surface.

B. Underside of Supported Floors and Structure Exposed to View: 4,000 pounds per square inch (27.6 MPa) 28 day concrete, form finish with honeycomb filled surface.

END OF SECTION

SECTION 042000
UNIT MASONRY

A. PART 1 - PRODUCTS

I. CONCRETE MASONRY UNITS

1. Concrete Block: Comply with referenced standards and as follows:
   a. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depth of 8 inches (200 mm).
   b. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depths as indicated on drawings for specific locations.
   c. Special Shapes: Provide nonstandard blocks configured for corners.
      i. Provide bullnose units for outside corners.
   d. Standard Units with Factory-Installed Insulation Inserts: ASTM C90, normal weight.
      i. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depth of 8 inches (200 mm).
      ii. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depths as indicated on drawings for specific locations.
      iii. Insulation Type: Manufacturer's standard expanded polystyrene (XPS).
      iv. Pattern: Vertical single score.
      v. Pattern: Vertically ribbed and split.
      vi. Pattern:
      vii. Exposed Faces: Color and texture to be selected from manufacturer's standard range.
      viii. Exposed Faces, Color and Texture:
      ix. Manufacturers:
         1. Substitutions: See Section 016000 - Product Requirements.

3. Mortar: Mortar for exposed Shot Blasted-Face conditions shall be as selected from the Shot Blasted-Face manufacturer's line of mortar colors.

   a. Manufacturers:
      Adams Products Company, Oldcastle, Architectural Products Group Companies.
      Cemex Corporation, Asheville, North Carolina

II. REINFORCEMENT AND ANCHORAGE

1. Manufacturers:
   a. Blok-Lok Limited www.blok-lok.com/#sle.
   b. Hohmann & Barnard, Inc; X-Seal Anchor: www.h-b.com/#sle.
   c. WIRE-BONDwww.wirebond.com/#sle.
   d. Substitutions: See Section 016000 - Product Requirements.

2. Reinforcing Steel: Type specified in Section 032000; size as indicated on drawings; galvanized finish.

3. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

4. Single Wythe Joint Reinforcement: ASTM A951/A951M.
   a. Type: Truss or ladder.
   b. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
   c. Size: 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not less than 5/8 inch (16 mm) of mortar coverage on each exposure.

5. Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
    a. Type: Truss.
    b. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
    c. Size: 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not less than 5/8 inch (16 mm) of mortar coverage on each exposure.

6. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
    a. Type: Truss, with adjustable ties or tabs spaced at 16 in (406 mm) on center.
    b. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
    c. Size: 0.1875 inch (4.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods and adjustable components of 0.1875 inch (4.8 mm)wire, width of components as required to provide not less than 5/8 inch (16 mm) of mortar coverage from each masonry face.
    d. Vertical adjustment: Not more than 1 1/4 inches (32 mm).
    e. Seismic Feature: Provide lip, hook, or clip on extended leg of wall ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch (3.8 mm) diameter.
    f. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

7. Strap Anchors: Bent steel shapes, 1-1/2 inch (38 mm) width, 0.105 inch (2.7 mm) thick, 24 inch (610 mm) length, with 1-1/2 inch (38 mm) long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.

8. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch (16 mm) of mortar coverage from masonry face.
    a. Concrete frame: Dovetail anchors of bent steel strap, nominal 1 inch (25 mm) width x 0.024 in (0.61 mm) thick, with trapezoidal wire ties 0.1875 inch (4.75 mm) thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
    b. Concrete frame: Dovetail anchors of bent steel strap, nominal 1 inch (25 mm) width x 0.024 in (0.61 mm) thick, with corrugated strap ties of nominal 1 inch (25 mm) width and 0.075 inch (1.91 mm) thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
    c. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch (6.3 mm) thick, with trapezoidal wire ties 0.1875 inch (4.75 mm) thick, hot dip galvanized to ASTM A 153/A 153M, Class B.

9. Residential Wall Ties: Corrugated formed sheet metal, 7/8 inch (22 mm) wide by 0.05 inch (1.22 mm) thick, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to extend at least 1-1/2 inches (38 mm) into the veneer with at least 5/8 inch (16 mm) of mortar coverage from masonry face.

10. 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).

11. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
    a. Anchor plates: Not less than 0.075 inch (1.91 mm) thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
    b. Wire ties: Manufacturer's standard shape, 0.1875 inch (4.75 mm) thick.
    c. Vertical adjustment: Not less than 3-1/2 inches (89 mm).
    d. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch (3.8 mm) diameter.

12. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

a. Manufacturers:
   i. ITW Commercial Construction North America; Teks Select Series www.ITWBuildex.com/#sle.
   ii. Substitutions: See Section 016000 - Product Requirements.

III. FLASHINGS

1. Metal Flashing Materials: Copper, as specified in Section 076200.

2. Metal Flashing Materials:
   a. Copper Flashing: ASTM B370, 060 soft annealed; 20 oz/sq ft (0.7 mm) thick; natural finish.
   b. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gauge, 0.0187 inch (0.48 mm) thick; finish 2B to 2D.
   c. Prefabricated Metal Flashing: Smooth fabricated 12 oz/sq ft (3.66 kg/sq m) copper flashing for surface mounted conditions.

3. Combination Asphaltic Flashing Materials - Copper:
   a. Copper/Asphalt Flashing: 3 oz/sq ft (0.915 kg/sq m) copper sheet coated with elastic asphalt compound on both sides.
      i. Manufacturers:
         1. Substitutions: See Section 016000 - Product Requirements.

4. Combination Nonasphaltic Flashing Materials - Copper:
   a. Copper/Polymer Film or Fabric Flashing: 3 oz/sq ft (0.915 kg/sq m) copper sheet laminated between two sheets of polyethylene film. Minimum Puncture Resistance of 780 psi (5.38 MPa), when measured in accordance with ASTM E154/E154M.
      i. Manufacturers:
      ii. Hohmann & Barnard, Inc; Copper-Fabric NA: www.h-b.com/#sle.
      iii. STS Coatings, Inc www.stscoatings.com/#sle.
      iv. WIRE-BONDwww.wirebond.com/#sle.
      v. York Manufacturing, Inc; Multi-Flash 500 Series: www.yorkmfg.com/#sle.
      vi. Substitutions: See Section 016000 - Product Requirements.
   b. Copper/Fiberglass Fabric Flashing: 3 oz/sq ft (0.915 kg/sq m) copper sheet laminated between two sheets of fiberglass fabric.
      i. Manufacturers:
         1. Advanced Building Products, Inc; Copper Sealtite 2000: www.advancedbuildingproducts.com/#sle.
         2. Substitutions: See Section 016000 - Product Requirements.
   c. Copper/Polymer Film or Fabric Flashing - Self-Adhering: 3 oz/sq ft (0.915 kg/sq m) copper sheet bonded on inward facing side to a sheet of polymer or fiberglass fabric that has a clear adhesive with a removable release liner.
      i. Manufacturers:
         1. Hohmann & Barnard, Inc; [____]: www.h-b.com/#sle.
         2. Substitutions: See Section 016000 - Product Requirements.
   d. Copper/Polymer Fabric Drainage Plane Flashing System: 3 oz/sq ft (0.915 kg/sq m) copper sheet bonded with rubber-based adhesive between one sheet of polymer fabric and one sheet of non-woven drainage material.
      i. Manufacturers:
         1. STS Coatings, Inc www.stscoatings.com/#sle.
         2. York Manufacturing, Inc; Flash-Vent: www.yorkmfg.com/#sle.
         3. Substitutions: See Section 016000 - Product Requirements.

5. Combination Non-Asphaltic Flashing Materials - Stainless Steel:
   a. Stainless Steel Flashing - Self-adhering: ASTM A240/A240M; 2 mil (0.05 mm) type 304 stainless steel sheet with 8 mil (0.20 mm) of butyl adhesive and a removable release liner.
      i. Manufacturers:
         1. STS Coatings, Inc www.stscoatings.com/#sle.

2. VaproShield, LLC www.vaproshield.com/#sle.
3. WIRE-BOND www.wirebond.com/#sle.
4. York Manufacturing, Inc; York 304: www.yorkmfg.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

b. Stainless Steel/Polymer Fabric Flashing: ASTM A240/A240M; 2 mil (0.05 mm) type 304 stainless steel sheet bonded on one side to one sheet of polymer fabric.
   i. Manufacturers:
      1. Hohmann & Barnard, Inc; Mighty-Flash Stainless Flashing: www.h-b.com/#sle.
      2. WIRE-BOND www.wirebond.com/#sle.
      3. York Manufacturing, Inc; Multi-Flash SS: www.yorkmfg.com/#sle.
      4. Substitutions: See Section 016000 - Product Requirements.

c. Stainless Steel/Polymer Fabric Flashing - Self-adhering: ASTM A240/A240M; 2 mil (0.05 mm) type 304 stainless steel sheet bonded on inward facing side to a sheet of polymer fabric that has a clear adhesive with a removable release liner.
   i. Manufacturers:
      1. Hohmann & Barnard, Inc www.h-b.com/#sle.
      2. Substitutions: See Section 016000 - Product Requirements.

d. Stainless Steel/Polymer Fabric Drainage Plane Flashing: ASTM A240/A240M; 2 mil (0.05 mm) type 304 stainless steel sheet bonded between one sheet of polymer fabric and one sheet of non-woven drainage material.
   i. Manufacturers:
      1. STS Coatings, Inc www.stscoatings.com/#sle.
      2. York Manufacturing, Inc; Flash-Vent SS: www.yorkmfg.com/#sle.
      3. Substitutions: See Section 016000 - Product Requirements.

e. Stainless Steel/Polymer Fabric Drainage Plane Flashing - Self-Adhering: ASTM A240/A240M; 2 mil (0.05 mm) type 304 stainless steel sheet with co-polymer butyl adhesive and a removable release liner on one side and a sheet of nonwoven drainage material bonded to the other side.
   i. Manufacturers:
      1. York Manufacturing, Inc; Flash-Vent SA: www.yorkmfg.com/#sle.
      2. Substitutions: See Section 016000 - Product Requirements.

6. Membrane Asphaltic Flashing Materials:
   a. Rubberized Asphalt Flashing: Self-adhering polymer modified asphalt sheet; 40 mils (0.040 inch) (1.0 mm) minimum total thickness; 8 mil (0.20 mm) cross-laminated polyethylene bonded to adhesive rubberized asphalt, with a removable release liner.
      i. Manufacturers:
         1. Advanced Building Products, Inc; Strip-N-Flash: www.advancedbuildingproducts.com/#sle.
         2. Heckmann Building Products, Incwww.heckmannbuildingprods.com/#sle
         3. WIRE-BOND www.wirebond.com/#sle.
         4. York Manufacturing, Inc; York Seal: www.yorkmfg.com/#sle.
         5. Substitutions: See Section 016000 - Product Requirements.

7. Membrane Non-Asphaltic Flashing Materials:
   a. Composite Polymer Flashings - Self-Adhering: Composite polyethylene; 40 mil (1mm) thick with pressure-sensitive adhesive and release paper.
      i. Manufacturers:
         1. Hohmann & Barnard, Inc; Textroflash: www.h-b.com/#sle.
         2. Hyload, Inc www.hyload.com/#sle.
         3. Substitutions: See Section 016000 - Product Requirements.
   b. EPDM Flashing: ASTM D4637/D4637M, Type I, 0.040 inch (1.0 mm) thick.
      i. Manufacturers:
         1. Heckmann Building Products, Inc:www.heckmannbuildingprods.com/#sle
         2. Hohmann & Barnard, Inc www.h-b.com/#sle.

3. WIRE-BOND www.wirebond.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

8. Factory-Fabricated Flashing Corners and End Dams: Stainless steel.
   a. Manufacturers:
      i. Hohmann & Barnard, Incwww.h-b.com/#sle.
      ii. Mortar Net Solutions; CompleteFlash: www.mortarnet.com/#sle.
      iii. York Manufacturing, Inc www.yorkmfg.com/#sle.
      iv. Substitutions: See Section 016000 - Product Requirements.

9. 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.
   a. Manufacturers, Synthetic Rubber Products:
      i. Mortar Net Solutions; BTL-1 Butyl Sealant: www.mortarnet.com/#sle.
      ii. Substitutions: See Section 016000 - Product Requirements.
   b. Manufacturers, Modified Polyether Products:
      i. Mortar Net Solutionswww.mortarnet.com/#sle.
      ii. York Manufacturing, Inc; UniverSeal US-100 Liquid Tape: www.yorkmfg.com/#sle.
      iii. Substitutions: See Section 016000 - Product Requirements.

10. Termination Bars: Stainless steel; compatible with membrane and adhesives.
    a. Manufacturers:
       i. Hohmann & Barnard, Incwww.h-b.com/#sle.
       ii. Mortar Net Solutions; Termination Bars: www.mortarnet.com/#sle.
       iii. York Manufacturing, Inc; Termination Bar: www.yorkmfg.com/#sle.

11. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.
    a. Manufacturers:
       i. Hohmann & Barnard, Inc www.h-b.com/#sle.
       ii. Mortar Net Solutions; Metal Drip Edges: www.mortarnet.com/#sle.
       iii. York Manufacturing, Inc www.yorkmfg.com/#sle.

12. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

IV. ACCESSORIES

1. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   a. Manufacturers:
      i. Blok-Lok Limitedwww.blok-lok.com/#sle.
      ii. Hohmann & Barnard, Incwww.h-b.com/#sle.
      iii. WIRE-BONDwww.wirebond.com/#sle.
      iv. Substitutions: See Section 016000 - Product Requirements.

2. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
   a. Manufacturers:
      i. Hohmann & Barnard, Incwww.h-b.com/#sle.
      ii. WIRE-BON www.wirebond.com/#sle.
      iii. Substitutions: See Section 016000 - Product Requirements.

3. 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.
   a. Full-Height Airspace Maintenance and Drainage Material: Mesh panels fitted between masonry ties.

i. Drainage Material Thickness: 3/8 inch (9.5 mm).
ii. Manufacturers:
1. Advanced Building Products, Inc; Mortairvent-CW: www.advancedbuildingproducts.com/#sle.
2. CavClear, a Division of Archovations Inc; CavClear Masonry Mat: www.cavclear.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.

b. Full-Height Airspace Maintenance and Drainage Material with Insulation: Mesh panels factory bonded to rigid insulation of type indicated and fitted between masonry ties.
i. Drainage Material Thickness: 3/8 inch (9.5 mm).
ii. Insulation Thickness: 1 inch (25.4 mm).
iii. Manufacturers:
1. CavClear, a Division of Archovations Inc; CavClear Insulation System: www.cavclear.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

c. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
i. Manufacturers:
1. Advanced Building Products, Inc; Mortar Break DT: www.advancedbuildingproducts.com/#sle.
2. Advanced Building Products Inc; Mortar Break: www.advancedbuildingproducts.com/#sle.
3. Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.
4. York Manufacturing, Incwww.yorkmfg.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

4. Building Paper: ASTM D226/D226M, Type I ("No.15") asphalt felt.

5. Nailing Strips: Softwood lumber, preservative treated; as specified in Section 061000.

6. Nailing Strips: Softwood lumber, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.

7. Weeps:
a. Type: Polyester mesh.
b. Color(s): As selected by Architect from manufacturer's full range.
c. Manufacturers:
i. Advanced Building Products, Incwww.advancedbuildingproducts.com/#sle.
ii. Blok-Lok Limitedwww.blok-lok.com/#sle.
iii. CavClear, a Division of Archovations Inc: www.cavclear.com/#sle.
iv. Hohmann & Barnard, Inc www.h-b.com/#sle.
v. Mortar Net Solutions; WeepVent: www.mortarnet.com/#sle.
vi. WIRE-BOND www.wirebond.com/#sle.
vii. Substitutions: See Section 016000 - Product Requirements.

8. Cavity Vents:
a. Type: Preformed aluminum vents with sloping louvers.
b. Color(s): As selected by Architect from manufacturer's full range.
c. Manufacturers:
i. Advanced Building Products, Inc www.advancedbuildingproducts.com/#sle.
ii. Blok-Lok Limited www.blok-lok.com/#sle.
iii. CavClear, a Division of Archovations Inc: www.cavclear.com/#sle.
iv. Hohmann & Barnard, Inc www.h-b.com/#sle.
v. Mortar Net Solutions; CellVent: www.mortarnet.com/#sle.
vi. WIRE-BOND www.wirebond.com/#sle.
vii. Substitutions: See Section 016000 - Product Requirements.

9. Termite-Excluding Weep and Vent:

a. Type: Polytetrafluoroethylene (PTFE) vent body with stainless-steel mesh closure.
b. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
c. Stainless Steel Mesh: ASTM E11 ; opening size 0.018 inch (0.44 mm), maximum.

10. Drainage Fabric: Polyester or polypropylene mesh bonded to a water and vapor-permeable fabric.
    a. Manufacturers:
        i. Advanced Building Products, Inc;
           Mortairvent: www.advancedbuildingproducts.com/#sle.
        ii. Mortar Net Solutions; DriPlane: www.mortarnet.com/#sle.
        iii. York Manufacturing, Inc; Weep Armor Weep Vent
             Protection: www.yorkmfg.com/#sle.
        iv. Substitutions: See Section 016000 - Product Requirements.

11. Multicomponent Cavity Wall Drainage System: Combination mortar diverter, flashing and weep system.
    a. Membrane Type: Thermoplastic vinyl.
    b. Drip Edge: Galvanized steel with factory applied, high-performance organic coating.
    c. Drip Edge Color: Selected by Architect from manufacturer's standard custom range.
    d. Termination Bar: Polyvinyl chloride (PVC).
    e. System Unit Length: 5 feet, 6 inches (1676 mm).
    f. Manufacturers:
        i. Mortar Net Solutions; TotalFlash Panel: www.mortarnet.com/#sle.
        ii. Substitutions: See Section 016000 - Product Requirements.

12. Chimney Cap: Precast concrete, sized to cover chimney construction plus additional overhang for drip on four sides, thickness as indicated, sloped from flue opening to edges for natural drainage.

13. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

END OF SECTION

SECTION 051200
STRUCTURAL STEEL FRAMING

PART 1 - PRODUCTS

1.1 MATERIALS

A. Steel W Shapes and Tees: ASTM A992/A992M.

B. Steel Shapes, Plates, and Bars: ASTM A242/A242M high-strength, corrosion-resistant structural steel.

C. Steel Shapes, Plates, and Bars: ASTM A529/A529M high-strength, carbon-manganese structural steel, Grade 50.

D. Hot-Formed Structural Tubing: ASTM A501/A501M, seamless or welded.

E. Steel Plate: ASTM A514/A514M.

F. Pipe: ASTM A53/A53M, Grade B, Finish black.

G. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

H. Sag Rods: ASTM A36/A36M.

I. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A and galvanized in compliance with ASTM A153/A153M Class C.

J. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.

K. Tension Control Bolts: Twist-off type; ASTM F3125/F3125M.

L. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.

M. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

N. 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).
   3. Height Change, Plastic State; when tested according to ASTM C827/C827M:
      a. Maximum: Plus 4 percent.
      b. Minimum: Plus 1 percent.

O. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

1.2 FINISH

A. Prepare structural component surfaces in accordance with SSPC-SP 3.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

C.

D. Galvanize structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating. (Provide minimum 530 g/sq m galvanized coating.)

1.3 SOURCE QUALITY CONTROL

A. Provide shop testing and analysis of structural steel.

B. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts," testing at least 10% percent of bolts at each connection.

END OF SECTION

SECTION 053100
STEEL DECKING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Roof deck.

B. Metal form deck.

C. Supplementary framing for openings up to and including 18 inches (450 mm).

D. Bearing plates and angles.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete topping over metal deck.

B. Section 042000 - Unit Masonry: Placement of anchors for bearing plates embedded in unit masonry assemblies.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished 2018.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

D. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel 2020.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

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 2021a.

G. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.

H. ASTM E384 - Standard Test Method for Microindentation Hardness of Materials 2017.

I. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification 2014 (Amended 2015).

J. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2021).

K. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel 2018.

L. FM (AG) - FM Approval Guide current edition.

M. FM DS 1-28 - Wind Design 2016.

N. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components 2016, with Editorial Revision (2020).

O. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172 2019.

P. ICC-ES AC43 - Acceptance Criteria for Steel Deck Roof and Floor Systems 2016.

Q. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements 2016.

R. ITS (DIR) - Directory of Listed Products current edition.

S. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

T. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks 2007.

U. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).

V. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic) 2019.

W. UL 209 - Cellular Metal Floor Raceways and Fittings Current Edition, Including All Revisions.

X. UL (DIR) - Online Certifications Directory Current Edition.

Y. UL (FRD) - Fire Resistance Directory Current Edition.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Cellular Floor Deck Electrical Raceway System: Coordinate the work with other trades to provide electrical service fittings compatible with the raceway system to be installed.

1.5 SUBMITTALS

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

B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
   1. Cellular Floor Deck Electrical Raceway System: Include conductor and cable fill capacities.

C. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
   1. Cellular Floor Deck Electrical Raceway System: Include insert spacing and height and trench header duct layout.

D. Certificates: Certify that products furnished meet or exceed specified requirements.

E. Submit manufacturer's installation instructions.

F. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

G. Designer's Qualification Statement.

H. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.6 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M and dated no more than 12 months before start of scheduled welding work.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

C. Installer Qualifications: Company specializing in performing the work of this Section approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Steel Deck:
   1. Canam Steel Corporationwww.canam-steeljoists.ws.
   2. Cordeck, Inc www.cordeck.com/#sle.
   3. Nucor-Vulcraft Groupwww.vulcraft.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.2 STEEL DECK

A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.
   1. Calculate to structural working stress design and structural properties specified.
   2. Maximum Vertical Deflection of Floor Deck: 1/360 of span.
   3. Maximum Vertical Deflection of Form Deck: 1/360 of span.
   4. Maximum Lateral Deflection of Diaphragms: 1/500 of the height of the wall.

B.
   1. GalvanizSteel Sheet:, Structural Steel (SS){CH#28304}, with {CH#28305} galvan
   2. Ungalvanized Steel Sheet: ASTM A1008/A1008M, Designation SS, Grade 33, Type 1.
      a. Grade as required to meet performance criteria.
   3. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
   4. Structural Properties:
      a. Span Design: Single.
   5. Minimum Base Metal Thickness: 22 gauge, 0.0299 inch (0.76 mm).
   6. Side Joints: Lapped, welded.

C. Roof Deck: Non-composite type, fluted steel sheet:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
      a. Grade as required to meet performance criteria.
   2. Structural Properties:
      a. Span Design: Single.
   3. Minimum Base Metal Thickness: 22 gauge, 0.0299 inch (0.76 mm).
   4. Nominal Height: 1-1/2 inch (38 mm).
   5. Profile: Fluted; SDI NR.
   6. Formed Sheet Width: 24 inch (600 mm).
   7. Side Joints: Lock seam.
   8. End Joints: Lapped, welded.

D. Metal Form Deck: Corrugated sheet steel, with provision for ventilation of concrete:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
      a. Grade as required to meet performance criteria.
   2. Ungalvanized Steel Sheet: ASTM A1008/A1008M, Designation SS, Grade 33, Type 1.
      a. Grade as required to meet performance criteria.
   3. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
   4. Minimum Base Metal Thickness: [24 gauge] ([___] mm).
   5. Nominal Height: [5/8"] inch ([____] mm).

6. Formed Sheet Width: 24 inch (600 mm).
7. Side Joints: Lapped, welded.
8. End Joints: Lapped, welded.

2.3 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A36/A36M steel, galvanized per ASTM A123/A123M.

B. Stud Shear Connectors: Made from ASTM A108 Grade 1015 bars.

C. Welding Materials: AWS D1.1/D1.1M.

D. Fasteners: Galvanized hardened steel, self tapping.

E. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.
   1. Design Requirements: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.
   2. Material: Steel; ASTM A510/A510M.
      a. Hardness: Rockwell C 54.5, minimum.
      b. Tensile Strength: 285 kips per square inch (1965 MPa), minimum.
      c. Shear Strength: 175 kips per square inch (1205 MPa), minimum.
      d. Washers:
         1) Steel Bar Joist Framing Applications: 0.472 inch (12 mm) diameter, minimum.
         2) Exposed Roof Deck Applications: 0.591 inch (15 mm) diameter, minimum.
      e. Corrosion Resistance:
         1) Steel Bar Joist Framing Applications: ASTM B633, SC1, Type III zinc electroplate..
         2) Exposed Roof Deck Applications: Provide manufacturer's standard stainless steel sealing caps with bonded neoprene washer over each fastener.
   3. Products:
      a. Simpson Strong-Tie: www.strongtie.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

F. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
   1. Design Requirements for Sidelap Connections: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.
   2. Fasteners for Steel Roof Decks Protected with Waterproofing Membrane: ASTM B633, SC1, Type III zinc electroplate.
   3. Fasteners for Exposed Steel Roof Deck Application: Manufacturer's standard stainless steel with bonded neoprene washer.
   4. Products:
      a. ITW Commercial Construction North America; ITW CCNA-Buildex Teks Select Series www.ITWBuildex.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

G. Weld Washers: Mild steel, uncoated, 3/4 inch (19 mm) outside diameter, 1/8 inch (3 mm) thick.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

J. Flute Closures: Closed cell foam rubber, 1 inch (25 mm) thick; profiled to fit tight to the deck.

K. Acoustical Insulation: Glass fiber type, minimum 1.1 lb/cu ft (18 kg/cu m) density; profiled to suit deck.

2.4 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gauge, 0.0299 inch (0.76 mm) thick sheet steel; of profile and size as indicated; finished same as deck.

B. Roof Sump Pans: Formed sheet steel, 14 gauge, 0.0747 inch (1.90 mm) minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches (38 mm) below roof deck surface, bearing flange 3 inches (75 mm) wide, sealed watertight.

C. Floor Drain Pans: Formed sheet steel, 14 gauge, 0.0747 inch (1.90 mm) minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches (38 mm) below floor deck surface, bearing flange 3 inches (75 mm) wide, sealed watertight.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.2 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.

B. On concrete and masonry surfaces provide minimum 4 inch (100 mm) bearing.

C. At cellular deck intended for electrical raceways level and align deck within 1/8 inch (3 mm) horizontally and vertically. Butt ends, allow for maximum 1/8 inch (3 mm) gap. Install sheet steel covers over gaps wider than 1/8 inch (3 mm). Tape and seal joints watertight.

D. Fasten deck to steel support members at ends and intermediate supports at 12 inches (300 mm) on center maximum, parallel with the deck flute and at each transverse flute using methods specified.
   1. Welding: Use fusion welds through weld washers.
   2. Place and secure special deep fluted sections for integral concrete bridging.

E. Clinch lock seam side laps.

F. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.

G. At welded male/female side laps weld at 18 inches (450 mm) on center maximum.

H. Weld deck in accordance with AWS D1.3/D1.3M.

I. At deck openings greater than 18 inches (450 mm) in size, provide steel angle reinforcement. as specified in Section 051200.

J. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.

K. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.

L. Place metal cant strips in position and fusion weld.

M. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

N. Position floor drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

O. Weld stud shear connectors through steel deck to structural members below.

P. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

Section Includes:

C-shaped metal stud exterior wall framing
Fasteners

Related Sections: The following sections contain requirements that relate to this section:

Section 061000 Rough Carpentry
Section 072500 Gypsum Board Weather Resistant and Air Barrier System
Section 074213 Metal Composite Wall Panels

PERFORMANCE REQUIREMENTS

Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

Design Loads: As indicated.

Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).

Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.

SUBMITTALS

General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

Product data and installation instructions for each item of cold-formed metal framing and accessories.

QUALITY ASSURANCE

Component Design: Calculate structural properties of studs and joists in accordance with American Iron and Steel Institute (AISI) "Specification for Design of Cold-Formed Steel Structural Members."

Welding: Use qualified welders and comply with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel.

DELIVERY, STORAGE, AND HANDLING

Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

METAL FRAMING

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

Dale Industries, Inc.
Dietrich Industries, Inc.* (Guide Specification)
Unimast Incorporated

System Components: Manufacturers' standard load-bearing steel studs and joists of type, size, shape, and gage as indicated. With each type of metal framing required, provide manufacturer's standard steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories for applications indicated, as needed to provide a complete metal framing system.

Metal Stud Exterior Wall Framing (20psf LL)
Depth: 4" and 6" (see details on drawings for locations)
Flange: 1-5/8"
Gage: 18 Ga. @ Non-Load-Bearing Wall Framing w/ 25 PSF wind load
Stud Type: CSJ

MATERIALS AND FINISHES:

For 16-gage and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 40,000 psi; ASTM A 446, A 570, or A 611.

For 18-gage and lighter units, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A 446, A 570, or A 611.

Provide galvanized finish to metal framing components complying with ASTM A 525 for minimum G 60 coating. **All exterior metal stud wall framing to be galvanized.**

Fasteners: Provide nuts, bolts, washers, screws, and other fasteners with hot-dipped galvanized finish.

Electrodes for Welding: Comply with AWS Code and as recommended by stud manufacturer.

Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

FABRICATION

General: Framing components may be prefabricated into assemblies before erection. Fabricate panels plumb, square, true to line, and braced against racking with joints welded. Perform lifting of prefabricated units to prevent damage or distortion.

Fabricate units in jig templates to hold members in proper alignment and position and to assure consistent component placement.

Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer.

Wire tying of framing components is not permitted.

Fabrication Tolerances: Fabricate units to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet.

PART 3 - EXECUTION

INSTALLATION

General: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations.

Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24 inches o.c. spacing for nail or power-driven fasteners or 16 inches o.c. for other types of attachment. Provide fasteners at corners and ends of tracks.

Installation of Wall: Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges.

Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.

Install supplementary framing, blocking, and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.

Frame wall openings larger than 2 feet square with double stud at each jamb of frame except where more than two are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack stud same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.

Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.

Install horizontal stiffeners in stud system, spaced (vertical distance) at not more than 54 inches o.c. Weld at each intersection.

Erection Tolerances: Bolt or weld wall panels (at both horizontal and vertical junctures) to produce flush, even, true-to-line joints.

Maximum variation in plane and true position between prefabricated assemblies should not exceed 1/16 inch.

Field Painting: Touch-up damaged shop-applied protective coatings. Use compatible primer for prime-coated surfaces; use galvanizing repair system for galvanized surfaces.

END OF SECTION

SECTION 055000
METAL FABRICATIONS

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

Definition: Metal fabrications include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.

This section includes the following metal fabrications:

- Loose steel lintels.
- Loose bearing and leveling plates.
- Miscellaneous framing and supports, rough hardware.
- Steel stairs.
- Steel access walkways and supports.

Related Sections: The following sections contain requirements that relate to this section:

- Division 5 Section "Structural Steel" for structural steel framing system components.

DEFINITIONS

Definitions in ASTM E 985 for railing-related terms apply to this section.

SYSTEM PERFORMANCE REQUIREMENTS

Structural Performance of Railing Systems: Design, engineer, fabricate, and install railing systems to comply with requirements of ASTM E 985 for structural performance based on testing performed in accordance with ASTM E 894 and E 935.

Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.

Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:

Concentrated load of 300 lbf applied at any point non-concurrently, vertically downward, or horizontally. Uniform load of 100 lbf per linear ft. applied non-concurrently, vertically downward or horizontally.

Concentrated and uniform loads above need not be assumed to act concurrently.

Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:

Concentrated load of 200 lbf applied at any point non-concurrently, vertically downward or horizontally.

Uniform load of 50 lbf per linear foot applied non-concurrently, vertically downward or horizontally.

Concentrated and uniform loads above need not be assumed to act concurrently.

Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lbf applied to one sq. ft. at any point in the system including panels, intermediate rails balusters, or other elements composing the infill area.

Above load need not be assumed to act concurrently with uniform horizontal loads on top rails of railing systems in determining stress on guard.

Treads of Steel Stairs: Capable of withstanding a uniform load of 100 lbf per sq. ft. or a concentrated load of 300 lbf on a area of 4 sq. inches located in the center of the tread, whichever produces the greater stress.

Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 lbf per sq. ft.

SUBMITTALS

General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

Product data for products used in miscellaneous metal fabrications, including paint products and grout.

Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

Where installed metal fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis.

Samples representative of materials and finished products as may be requested by Architect.

Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

QUALITY ASSURANCE

Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel," D1.3 "Structural Welding Code - Sheet Steel", and D1.2 "Structural Welding Code - Aluminum."

Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

PROJECT CONDITIONS

Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

COORDINATION

Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

SEQUENCING AND SCHEDULING

Sequence and coordinate installation of guardrails as follows:

Mount guardrails only as permanent installation. Do not support rails temporarily by any means not satisfying structural performance requirements.

PART 2 - PRODUCTS

FERROUS METALS

Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

Steel Plates, Shapes, and Bars: ASTM A 36.

Cold-Formed Steel Tubing: ASTM A 500, or hot rolled, ASTM A 501, grade as indicated below:

Grade A, unless otherwise indicated or required for design loading.

For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.

Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

Type F, standard weight (schedule 40), unless otherwise indicated, or another weight, type, and grade required by structural loads.

For exterior installations and where indicated, provide piping with hot-dip galvanized coating per ASTM A 53.

Commercial Quality Sheet: Product type and method of manufacture as follows:

Cold-Rolled: ASTM A 366
Hot-Rolled: ASTM A 569

Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

GROUT AND ANCHORING CEMENT

Non-shrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C588. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

Non-shrink Nonmetallic Grouts:

"Bonsal Construction Grout"; W.R. Bonsal Co.
"Diamond-Crete Grout"; Concrete Service Materials Co.
"Kemset"; Chem-Masters Corp.
"Sealtight 588 Grout"; W.R. Meadows, Inc.

FASTENERS

General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

Lag Bolts: Square head type, FS FF-B-561.

Machine Screws: Cadmium plated steel, FS FF-S-92.

Wood Screws: Flat head carbon steel, FS FF-S-111.

Plain Washers: Round, carbon steel, FS FF-W-92.

Drilled-In Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.

Lock Washers: Helical spring type carbon steel, FS FF-W-84.

PAINT

Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

Zinc Chromate Primer: FS TT-P-645.

FABRICATION, GENERAL

Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

Shear and punch metals cleanly and accurately. Remove burrs.

Ease exposed edges to a radius of approximately 1/32-inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

Remove sharp or rough areas on exposed traffic surfaces.

Weld corners and seams continuously to comply with AWS recommendations. 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. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

STEEL LADDERS

General: Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as indicated. Comply with requirements of ANSI A14.3.

Siderails: Continuous steel flat bars, 1/2 inch x 3 inches, with eased edges, spaced 18 inches apart.

Bar Rungs: Round steel bars, 3/4 inch diameter, spaced 11 inches o/c.

Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.

Support each ladder at top and bottom by means of welded or bolted steel brackets.

Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.

Extend side rails 48 inches above top rung.

Provide non-slip surface on top of each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.

For exterior installations and where indicated, provide ladders with hot-dip galvanized coating per ASTM A 53.

LOOSE BEARING AND LEVELING PLATES

Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. **Galvanize after fabrication.**

LOOSE STEEL LINTELS

Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions. Unless otherwise indicated provide steel lintels in sizes as shown on the structural drawings.

Weld adjoining members together to form a single unit where indicated.

Size loose lintels for equal bearing of one inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.

Galvanize loose steel lintels located in exterior walls or exposed to the weather.

MISCELLANEOUS FRAMING AND SUPPORTS

General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.

Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

ROUGH HARDWARE

Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures.

Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

STEEL PIPE AND TUBE RAILINGS AND HANDRAILS

General: Fabricate pipe and tube railings and handrails to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe and tube, post spacings, and anchorage, but not less than that required to support structural loads.

Interconnect railing and handrail members by coping and butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

At pipe tee and cross intersections, coped joints to fit contour of pipe to which end is joined and weld all around.

Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

Form changes in direction by welding in prefabricated flush elbow fittings, by bending, or by mitering.

Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

Close exposed ends of tubes and pipe by welding 3/16 inch thick steel plate in place or by use of prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4 inch or less.

Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and tube and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work. Provide steel sheet or plate fillers of thickness and size indicated or required to support

structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thickness. Size fillers to produce adequate bearing to prevent bracket rotation and overstressing of substrate.

For exterior steel railings and handrails formed from steel pipe with galvanized finish, galvanize all fittings, brackets, fasteners, sleeves, and other ferrous components.

For interior steel railings and handrails formed from steel pipe with galvanized finish, galvanize all fittings, brackets, fasteners, sleeves, and other ferrous components.

STEEL FRAMED STAIRS

General: Provide complete stair assemblies of type indicated, including metal framing, hangers, columns, railings struts, clips, brackets, bearing plates, and other components necessary for the support of stairs and platforms.

Fabricate stringers as shown on the drawings of structural steel channels, tubes, or plates or a combination thereof, and platforms of structural steel channel or tube headers and miscellaneous framing members, of size indicated or required to support the design loads.

Where masonry walls support steel stairs provide temporary supporting struts designed for erecting steel stair components before installing masonry.

Metal Pan Risers, Sub-treads, and Sub-platforms: Shape metal pans from hot-rolled or cold-rolled steel sheet to configuration shown on drawings.

PIPE BOLLARDS

Fabricate pipe bollards from Schedule 80 steel pipe. Cap bollards with 1/4" minimum thickness steel plate.

FINISHES, GENERAL

Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

Finish metal fabrications after assembly.

STEEL AND IRON FINISHES

Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process compliance with the following requirements:

ASTM A 153 for galvanizing iron and steel hardware.

ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mills scale in accordance with SSPC SP-2 "Hand Tool Cleaning", or SSPC SP-3 "Power Tool Cleaning", or SSPC SP-7 "Brush-Off Blast Cleaning".

Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning".

Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions, and at a rate to provide uniform dry film thickness of 2.0 mils for each coat.

PART 3 - EXECUTION

PREPARATION

Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

INSTALLATION, GENERAL

Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:

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.

At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

SETTING LOOSE PLATES

Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

Use nonmetallic non-shrink grout in exposed locations, unless otherwise indicated.

Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

INSTALLATION OF STEEL TUBE PIPE RAILINGS

Align modular railing sections prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction.

At concrete slab conditions anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.

Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8 inch build-up, sloped away from post. For installations exposed on exterior, or to flow of water, seal anchoring material to comply with grout manufacturer's directions.

At masonry wall conditions anchor rail ends with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.

Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2 inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:

Use type of bracket with pre-drilled hole for exposed bolt anchorage.

For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.

For hollow masonry anchorage, use toggle bolts having square heads.

For wood stud partitions, use lag bolts set into wood backing between studs. Coordinate with stud installations for accurate location of backing members.

For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of post.

INSTALLATION OF BOLLARDS

Anchor bollards in concrete by means of pipe sleeves preset and anchored into concrete. After bollards have been inserted into sleeves, fill annular space between bollard and sleeve solid with non-shrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's directions.

ADJUSTING AND CLEANING

Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.

Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting" of these specifications.

For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section includes the following:

- Wood framing
- Wood grounds, nailers, and blocking
- Plywood wall sheathing
- Plywood equipment backboards

Related Sections: The following Sections contain requirements that relate to this Section:

Division 6 Section "Finish Carpentry" for finish woodwork specially fabricated for this Project.
Division 7 Section Exterior Insulation & Finish Systems (EIFS)

DEFINITIONS

Rough carpentry includes carpentry work not specified as part of other Sections and generally not exposed, unless otherwise specified.

SUBMITTALS

General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

Wood treatment data as follows including chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material:

For each type of preservative treated wood product include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.

QUALITY ASSURANCE

Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood products from one source from a single manufacturer.

DELIVERY, STORAGE, AND HANDLING

Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

PART TWO-PRODUCTS

LUMBER, GENERAL

Lumber Standards: Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

Inspection Agencies: Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:

NLGA:	National Lumber Grades Authority (Canadian).
SPIB:	Southern Pine Inspection Bureau.
WCLIB:	West Coast Lumber Inspection Bureau.
WWPA:	Western Wood Products Association.

Grade Stamps: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

Provide dressed lumber, S4S, unless otherwise indicated.

Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment, unless otherwise indicated.

PLYWOOD

Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood construction panels and, for products not manufactured under PS 1 provisions, with APA PRP-108.

Trademark: Furnish construction panels that are each factory-marked with APA trademark evidencing compliance with grade requirements.

General: Where construction panels are indicated for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements designated under each application for grade designation, span rating, exposure durability classification, edge detail (where applicable), and thickness.

Equipment Backing Panels:

Exposure Durability Classification: EXPOSURE 2.

Grade: B-D plugged

Min. Thickness: 3/4"

FASTENERS

General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel. Use stainless steel nails or screws in all fire-retardant lumber.

Nails, Wire, Brads, and Staples: FS FF-N-105.

Power Driven Fasteners: National Evaluation Report NER-272.

Wood and Metal Screws: ANSI B18.6.1.

Lag Bolts: ANSI B18.2.1.

Bolts, Nuts and Washers: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers. Furnish sizes, types and quantities required to complete work. Bolts, nuts and washers exposed shall be non-corroding type.

Expansion Shields: Lead type for lag bolts or wood screw as required. Furnish sizes and quantities required to complete work.

Toggle Bolts: Tumble-wing type, Federal Specifications FF-B-588, see drawing for sizes required.

Adhesive: Glue adhesive conforming with Performance Specification AFG-01.

Gypsum Sheathing Fasteners @ Metal Stud Framing: Bugle head, self-tapping, rust-resistant, fine thread for heavy-steel gauge. Bugle head, rust-resistant sharp point, fine thread for light-gauge metal framing or furring.

PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS

General: Where lumber or plywood is indicated as preservative- treated wood or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood). Mark each treated item with the AWPB or SPIB Quality Mark Requirements.

Pressure-treat above-ground items with water-borne preservatives to a minimum retention of 0.25 pcf. For interior uses, after treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:

Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

Wood framing members less than 18 inches above grade.

Wood floor plates installed over concrete slabs directly in contact with earth.

Pressure-treat wood members in contact with the ground or fresh water with water-borne preservatives to a minimum retention of 0.40 pcf.

PART THREE-EXECUTION

INSTALLATION, GENERAL .

Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.

Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.

Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

Examine Subframing: Verify that surface of framing and furring members to receive sheathing does not vary more than 1/4" from the placement of faces of adjacent members.

WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

WOOD FRAMING, GENERAL

Framing Standard: Comply with N.F.P.A. "Manual for House Framing," unless otherwise indicated.

Install framing members of size and spacing indicated.

Anchor and nail as shown, and to comply with the following:

National Evaluation Report No. NER-272 for pneumatic or mechanical driven staples, P-Nails, and allied fasteners.

Published requirements of manufacturer of metal framing anchors.

"Recommended Nailing Schedule" of referenced framing standard and with N.F.P.A. "National Design Specifications for Wood Construction."

PLYWOOD PANELS

General: Comply with applicable recommendations contained in Form No. E30, "APA Design/Construction Guide - Residential & Commercial," for types of construction panels and applications indicated.

Fastening Methods: Fasten panels as indicated below:

Plywood Backing Panels: Anchor to CMU's with expansion or toggle anchors where applicable.

Plywood Backing Panels: Screw to metal studs where applicable.

END OF SECTION

SECTION 064113
INTERIOR ARCHITECTURAL CASEWORK

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section includes the following:

Plastic laminate covered cabinets and casework.
Plastic laminate countertops.

Related Sections: The following sections contain requirements that relate to this section:

Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work that is not exposed to view.

Division 6 Section "Finish Carpentry" for carpentry exposed to view that is not specified in this section.

Division 9 Section "Painting" for final finishing of installed architectural casework.

SUBMITTALS

Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:

Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

Samples: Samples of plastic laminate, hardware, wood and wood finishes, shall be submitted to the Architect for selection and approval. Plastic laminate colors and patterns shall be as selected by the Architect from the casework manufacturer's standards.

Product certificates signed by woodwork manufacturer certifying that products comply with specified requirements.

Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

QUALITY ASSURANCE

Manufacturer Qualifications: Firm experienced in successfully producing architectural woodwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

Installer Qualifications: Arrange for installation of architectural woodwork by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.

AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.

DELIVERY, STORAGE, AND HANDLING

Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

PROJECT CONDITIONS

Environmental Conditions: Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

MATERIALS

Standards: Provide materials that comply with requirements of the AWI woodworking standard for each type of woodwork and quality grade indicated and, where the following products are part of woodwork, with requirements of the referenced product standards, that apply to product characteristics indicated:

Hardboard: ANSI/AHA A135.4
High Pressure Laminate: NEMA LD 3.
Medium Density Fiberboard: ANSI A208.2.
Particleboard: ANSI A208.1
Softwood Plywood: PS 1.

Lumber Material to be Douglas Fir grade "B and better", in accordance with Western Wood Products Association (WWPA) grading procedures. Edges shall be sanded to 1/16" radius curve.

Nails: Material shall be finishing nails of appropriate size and type and shall be countersunk.

Screws: Material shall be of appropriate size and type and shall have finished type head.

Countertops: See Section 06651 for Solid Surface Fabrications
All Laminate Countertops to have integral backsplashes

Glue shall be as recommended by manufacturer.

FABRICATION, GENERAL

Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

Complete fabrication, including assembly, finishing, and hardware application, before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

Factory-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges of cutouts with a water-resistant coating.

LAMINATE CLAD CABINETS (PLASTIC-COVERED CASEWORK)

Quality Standard: Comply with AWI Section 400 and its Division 400B "Laminate Clad Cabinets."

AWI Grade: Custom.

AWI Type of Cabinet Construction: Flush overlay (inset panels).

Plastic Laminate (PL-1) High pressure decorative laminate complying with the following requirements:

Manufacturer: Wilsonart
Series: Pinnacle Walnut 7992-38
Finish: Fine Velvet Finish

Plastic Laminate (PL-2) High pressure decorative laminate complying with the following requirements:

Manufacturer: Wilsonart
Series: Bainbrook Grey 1863-55
Finish: Glaze Finish
Application: Countertop with Integral Backspash

Plastic Laminate (PL-3) High pressure decorative laminate complying with the following requirements:

Manufacturer: Wilsonart
Series: Grey 1500-60
Finish: Matte Finish

Plastic Laminate (PL-4) High pressure decorative laminate complying with the following requirements:

Manufacturer: Wilsonart
Series: Organic Cotton 4945
Finish: Matte Finish

Casework exteriors including all door and drawer fronts, open shelving, face frame and related face items shall be laminated plastic surfaced panels in solid colors or wood grains as per manufacturer standard listing. Adhesive shall be waterproof type as recommended by surfacing manufacturer. Surfacing shall be uniformly bonded to underlayment. Finish shall be free of eaves and buckles with face surfaces smooth and even. All exposed ends and edges shall be self-edged, finished smooth colors or woodgrains to match exterior to visible surfaces. No joints will be permitted in surfacing except at self-edged ends.

Casework interiors and shelving shall be fabricated of melamine surfaced panels consisting of melamine impregnated surface sheets thermal-fused to the faces of commercial standard (CS-236-66) particle board-45 pound density.

CABINET HARDWARE AND ACCESSORY MATERIALS

General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

Hardware Standard: Comply with ANSI/BHMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BHMA numbers or referenced to this standard.

Cabinet Hardware Schedule: Coordinate with Interior Designer & Architect

Pulls: AMEROCK Bar Pulls 5-1/16” Center to Center Pull in Sterling Nickle BP19541

FASTENERS AND ANCHORS

Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.

For metal framing supports, provide screws as recommended by metal framing manufacturer.

Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

PART 3 - EXECUTION

PREPARATION

Condition woodwork to average prevailing humidity conditions in installation areas before installing.

Deliver concrete inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.

Before installing examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

INSTALLATION

Quality Standard: Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.

Install cabinets plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 8'-0" for plumb and level (including tops) and with no variations in flushness of adjoining surfaces.

Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

Adjustment: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated. Maintain veneer sequence matching (if any) of cabinets with transparent finish.

Tops: Anchor securely to base units and other support systems as indicated.

Refer to the Division 9 sections for final finishing of installed architectural woodwork.

ADJUSTMENT AND CLEANING

Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

Clean, lubricate, and adjust hardware.

Clean woodwork on exposed and semi-exposed surfaces. Touch up finishes to restore damaged or soiled areas.

PROTECTION

Provide final protection and maintain conditions such that woodwork is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 066116
SOLID SURFACING FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Provide solid surfacing fabrications including but not limited to following:

1. Kitchen Counter (First Floor)
2. Store Counter

B. Related Sections: Following description of work is included for reference only and shall not be presumed complete:

1. Provision of indoor air quality requirements: Section 01 81 19, Indoor Air Quality Requirements.
2. Provision of finish carpentry and architectural woodwork: Section 06 40 00, Architectural Woodwork.
3. Provision of elastomeric joint sealants: Section 07 92 00, Joint Sealants.
4. Provision of tile work: Section 09 30 00, Tiling.
5. Provision of wall coverings: Section 09 72 00, Wall Coverings.

1.02 REFERENCES

A. Abbreviations and Acronyms:

1. MDF: Medium Density Fiberboard.
2. VOC: Volatile Organic Compound.

B. Definitions:

1. Solid Surface: Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

C. Reference Standards:

1. ANSI/NPA A208.2-09 - Medium Density Fiberboard (MDF) For Interior Applications
2. ASTM C920-14a - Standard Specification for Elastomeric Joint Sealants
3. ASTM D638-10 - Standard Test Method for Tensile Properties of Plastics
4. ASTM D785-08 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials
5. ASTM D790-10 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
6. ASTM D5420-10 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)
7. ASTM E84-14 - Standard Test Method for Surface Burning Characteristics of Building Materials
8. ASTM E228-11 - Standard Test Method for Linear Thermal Expansion of Solid Materials with a Push-Rod Dilatometer
9. ASTM G21-13 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

1.03 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meetings: Arrange pre-installation meeting 1 week prior to commencing work with all parties associated with trade as designated in Contract Documents or as requested by Architect.

1.04 SUBMITTALS

A. Product Data: Indicate Product description including solid surface sheets, sinks, bowls and illustrating full range of standard colors, fabrication information and compliance with specified performance requirements. Submit Product data with resistance to list of chemicals.

B. Shop Drawings: Submit Shop Drawings for work of this Section in accordance with Section 013000. Indicate plans, sections, dimensions, component sizes, edge details, thermosetting requirements, fabrication details, attachment provisions, sizes of furring, blocking, including concealed blocking and coordination requirements with adjacent work. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacles and other items installed in solid surface.

C. Samples: Submit samples in accordance with Section 013000. Submit minimum 6" x 6" samples. Cut sample and seam together for representation of inconspicuous seam. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work.

1.05 CLOSEOUT SUBMITTALS

A. Operational and Maintenance Data:

1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in Project closeout documents.
2. Provide a commercial care and maintenance kit . Review maintenance procedures and warranty details with Owner upon completion.

1.06 QUALITY ASSURANCE

A. Qualifications:
1. Installers: Provide work of this Section executed by competent installers with minimum 5 years experience in the application of Products, systems and assemblies specified and with approval and training of the Product manufacturers.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements: Deliver no components to Project site until areas are ready for installation.

B. Storage and Handling Requirements:
1. Store components indoors prior to installation.
2. Handle materials to prevent damage to finished surfaces.

1.08 WARRANTY

A. Manufacturer Warranty: Provide manufacturer’s standard warranty for material only for period of 10 years against defects and/or deficiencies in accordance with General Conditions of the Contract. Promptly correct any defects or deficiencies, which become apparent within warranty period, to satisfaction of Architect and at no expense to Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer List: Products of following manufacturers are acceptable subject to conformance to requirements of Drawings, Schedules and Specifications:
1. Corian® by DuPont; www.corian.com
Color: Linen

B. No Substitutions will be accepted.

2.02 MATERIALS

A. Solid Surface Material Description: Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment; not coated, laminated or of composite construction; meeting following criteria:
1. Flammability: Class 1 and A when tested to UL 723.

B. Performance/Design Criteria:

	Property	Requirement (min or max)	Test Procedure
1.	Solid Surface Based Products:		
a.	Tensile Strength	6000 psi min	ASTM D638
b.	Tensile Modulus	1.5 x 10^6 psi min	ASTM D638
c.	Tensile Elongation	0.4% min.	ASTM D638
d.	Flexural Strength	10000 psi min	ASTM D790
e.	Flexural Modulus	1.2 x 10^6 psi min	ASTM D790
f.	Hardness	>85-Rockwell "M" scale min.	ASTM D785
g.	Thermal Expansion	2.2 x 10^{-5} in./in./°F	ASTM E228
h.	Fungi and Bacteria	Does not support microbial growth	ASTM G21 & G22
i.	Microbial Resistance	Highly resistant to mold growth	UL 2824
j.	Ball Impact	No fracture - 1/2 lb. Ball: 6 mm slab - 36" drop 12 mm slab - 144" drop	NEMA LD 3, Method 3.8
k.	Weatherability	ΔE*94<5 in 1,000 hrs	ASTM G155
l.	Flammability		ASTM E84, NFPA 255 & UL 723
m.	Flame Spread	<25	
n.	Smoke Developed	<25	
o.	Class	A	NFPA 101®, Life Safety Code

C. Adhesive for Bonding to Other Products: One component silicone to ASTM C920.

D. Sealant: A standard mildew-resistant, FDA/UL® [and NSF/ANSI 51 compliant in Food Zone area,] recognized silicone color matched sealant or clear silicone sealants.

E. Sink/Bowl Mounting Hardware: Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount sinks/bowls.

F. Heat Reflecting Tape: Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.

G. Insulating Nomex® Fabric: Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.

2.03 COMPONENTS

A. Counter Perimeter Frame: Ensure 1/2" thick, moisture resistant [cores for counter tops in wet areas having sinks or lavatories are 3/4" thick exterior grade plywood with waterproof adhesive, Fir or Poplar plywood, veneer core only.] [MDF core conforming to ANSI/NPA A208.2 balanced design, manufactured from recycled materials, meeting ANSI Standards for emissions, of minimum density of 48 lb/cu ft and surface character to match sample approved by Architect. Ensure fire retardant Product contains fire-retardant chemicals injected with raw materials during

manufacturing and achieves a maximum flame-spread rating of 25 with a maximum smoke development of 200 when tested to ASTM E84.]

C. Lavatory Tops with Undermount Bowls: 1/2" or ¾"thick countertop of solid surfacing material, cast to desired profiles and sizes having edge details as indicated on Drawings. Provide countertops complete with backsplashes of size shown on Drawings. Use undermount hardware according to manufacturer's instructions. Ensure vanity top and backsplash is **"Weathered Concrete"** color.

G. Fabrication:
1. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved Shop Drawings and solid polymer manufacturer requirements. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints. Provide factory cutouts for plumbing fittings and bath accessories as indicated on Drawings.
2. Where indicated, thermoform corners and edges or other objects to shapes and sizes indicated on Drawings, prior to seaming and joining. Cut components larger than finished dimensions and sand edges to remove nicks and scratches. Heat entire component uniformly prior to forming.
3. Ensure no blistering, whitening and cracking of components during forming.
4. Fabricate backsplashes from solid surfacing material with optional radius cove where counter and backsplashes meet as indicated on Drawings. Backsplashes for most colors may be fabricated by traditional means discussed in K-25294 *Backsplashe*s. Colors with metallic/mica particle or veined colors creating directional aesthetics (K-26833 *Directional Aesthetics*) may require the techniques in Technical Bulletin K-28235 *Thermoformed Backsplash*.
5. Fabricate joints between components using manufacturer's standard joint adhesive. Ensure joints are inconspicuous in appearance and without voids. Attach 50 mm (2") wide reinforcing strip of solid polymer material under each joint. Reinforcing strip of solid polymer material is not required when using DuPont™ Joint Adhesive 2.0.
6. Provide holes and cutouts for plumbing and bath accessories as indicated on Drawings.
7. Rout and finish component edges to a smooth, uniform finish. Rout cutouts, then sand edges smooth. Repair or reject defective or inaccurate work.
8. Finish: Ensure surfaces have uniform finish:
   a. Matte, with a 60° gloss rating of 5 - 20.
9. Fabrication Tolerances:
   a. Variation in Component Size: +/-1/8".
   b. Location of Openings: +/-1/8" from indicated location.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
1. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.
2. Verify actual site dimensions and location of adjacent materials prior to commencing work.
3. Examine cabinets upon which counter tops are to be installed. Verify cabinets are level to within 1/8" in 10' - 0".
4. Notify Architect in writing of any conditions which would be detrimental to installation.

B. Evaluation and Assessment: Commencement of work implies acceptance of previously completed work.

3.02 INSTALLATION

A. Install components plumb, level, rigid, scribed to adjacent finishes in accordance with reviewed Shop Drawings and Product installation details.

B. Fabricate field joints using manufacturer's recommended adhesive, with joints being inconspicuous in finished work. Exposed joints/seams are not permitted. Keep components and hands clean when making joints. Reinforce field joints as specified herein. Cut and finish component edges with clean, sharp returns.

C. Route radii and contours to template. Anchor securely to base component or other supports. Align adjacent components and form seams to comply with manufacturer's written recommendations using adhesive in color to match work. Carefully dress joints smooth, remove surface scratches and clean entire surface.

D. Install countertops with no more than 1/8" sag, bow or other variation from a straight line.

E. Adhere undermount/submount/bevel mount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.

F. Adhere topmount sinks/bowls to countertops using manufacturer recommended adhesives and color-coordinated silicone sealant. [Secure seam mount bowls and sinks to counter tops using color matched joint adhesive.]

G. Seal between wall and components with joint sealant as specified herein and in Section 07 92 00, as applicable.

H. Provide backsplashes and endsplashes as indicated on Drawings. Adhere to countertops using a standard color-coordinated silicone sealant. Adhere applied sidesplashes to countertops using a standard color-matched silicone sealant. Provide coved backsplashes and sidesplashes at walls and adjacent millwork. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on reviewed Shop Drawings. Adhere to countertops using manufacturer's standard color-coordinated joint adhesive.

I. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Ensure components are clean on date of Substantial Completion of the Work.

J. Coordinate connections of plumbing fixtures with [Division 22] [Mechanical]. Make plumbing connections to sinks in accordance with [Division 22] [Mechanical].

3.03 REPAIR

A. Repair minor imperfections and cracked seams and replace areas of severely damaged surfaces in accordance with manufacturer's "Technical Bulletins".

3.04 SITE QUALITY CONTROL

A. Non-Conforming Work: Replace damaged work which cannot be satisfactorily repaired, restored or cleaned, to satisfaction of Architect at no cost to Owner.

3.05 CLEANING

A. Remove excess adhesive and sealant from visible surfaces.

B. Clean surfaces in accordance with manufacturer's "Care and Maintenance Instructions".

3.06 PROTECTION

A. Provide protective coverings to prevent physical damage or staining following installation for duration of Project.

B. Protect surfaces from damage until date of Substantial Completion of the Work.

END OF SECTION

SECTION 071113
BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section includes the following:

Cold-applied asphalt emulsion dampproofing.

Related Sections: The following Sections contain requirements that relate to this Section:

Concrete masonry units and brick veneer are specified in Division 4 Section "Unit Masonry".

SUBMITTALS

General: Submit the following in accordance with Conditions of Contract and Division 1 Section "Submittals."

Product Data: Include data substantiating that materials comply with specified requirements for each dampproofing material specified.

QUALITY ASSURANCE

Installer Qualifications: Engage an experienced installer who has completed bituminous dampproofing work similar in material, design, and extent to that indicated for Project and that has resulted in construction with a record of successful in-service performance.

Single-Source Responsibility: Obtain primary dampproofing materials and primers from a single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

PROJECT CONDITIONS

Substrate: Proceed with dampproofing work only after substrate construction and penetrating work have been completed.

Weather: Proceed with dampproofing work only when existing and forecast weather conditions will permit work to be performed in accordance with manufacturer's recommendations.

Ventilation: Provide adequate ventilation during application of solvent-based components in enclosed spaces. Maintain ventilation until dampproofing membrane has thoroughly cured.

PART 2 - PRODUCTS

COLD-APPLIED ASPHALT EMULSION DAMPPROOFING

Asphalt Emulsion: Asphalt-base, clay emulsion coating with fibres specifically formulated to offer a tight film that combines both strength and resistance to water penetration. Emulsion is compounded for **brush-on or spray grade application** to penetrate substrate and build to moisture-resistant coating.

Provide semifibrated-type semimastic asbestos-free emulsion; ASTM D 1227, Type 4, except containing nonasbestos fibrous reinforcement and filler materials.

Manufacturer: Subject to compliance with requirements, provide asphalt emulsion dampproofing products of one of the following:

Karnak Chemical Corporation.
Sonneborne Building Products Div.
W.R. Meadows, Inc. • "Sealmastic" Type 2 Emulsion Coating (*Guide Specification)

PART 3 - EXECUTION

PREPARATION OF SUBSTRATE

Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer. Clean all scale, loose mortar, rust, dirt, oil, grease and other foreign matter. Use a wire brush or other methods in keeping with good practices.

Before appliction of dampproofing, fill voids, seal joints, and apply bond breakers (if any) as recommended by prime materials manufacturer, with particular attention at construction joints. Fill voids and cracks in masonry wall with cement mortar and allow to dry.

Prime substrate as recommended by prime materials manufacturer.

Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work, by masking or otherwise protecting adjoining work.

INSTALLATION, GENERAL

Comply with manufacturer's recommendations, except where more stringent requirements are indicated or specified and where project conditions require extra precautions or provisions to ensure satisfactory performance of work.

BITUMINOUS DAMPPROOFING INSTALLATION

General: Apply dampproofing to exterior face of concrete masonry unit wythe at all exterior masonry veneer cavity walls.

Extend vertical dampproofing from top of footing to top of masonry wythe at roof bearing conditions.

Apply coat of cold, bituminous dampproofing material, by brushing or spraying at rate of 1 gallon per 30-35 sq. ft., depending upon substrate texture and porosity of surface, as required to produce a uniform dry film thickness of not less than 1/16" thick.

Stir dampproofing thoroughly in the container prior to applying by soft bristle brush or suitable spray equipment. Apply to surfaces at temperatures above 40° F. Apply in continuous, unbroken film, free of pinholes.

Keep material from freezing in the original container and do not apply when temperatures below 35° F. are anticipated. Do not apply in rain or when rain is threatening.

Avoid subjecting dampproofing to prolonged exposure to sunlight.

END OF SECTION

SECTION 072100
BUILDING INSULATION

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section includes the following:

Nailable Roof Insulation
Closed Cell Spray Polyurethane Foam Insulation
Extruded Polystyrene Insulation
Thermal Batt Insulation
Sound Batt Insulation.

Related Sections: The following sections contain requirements that relate to this Section:

Division 4 – Unit Masonry
Division 7 – Metal Roofing Systems for rigid board roof insulation and acoustical infill insulation.

SUBMITTALS

General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

Product data and full thickness samples for each type of insulation product specified.

Submit independent laboratory test reports, data sheets, physical properties, and samples as required by local code officials.

Submit the technical data sheet from the manufacturer showing the test results from the ASTM E84 (Surface Burning Characteristics) and ICC ESR #1172.

QUALITY ASSURANCE

Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

Surface Burning Characteristic: ASTM E 84.
Fire Resistance Ratings: ASTM E 119.
Combustion Characteristics: ASTM E 136.

Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work. Provide materials from company specializing in manufacturing the products specified in this section with minimum five (5) years experience.

Applicator: Company specializing in performing the work of this section shall be certified & trained by the manufacturer and shall have a minimum of five (5) years documented work experience.

DELIVERY, STORAGE, AND HANDLING

Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

Protect plastic insulation as follows:

Do not expose to sunlight, except to extent necessary for period of installation and concealment.

Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.

Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

MANUFACTURERS

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

Extruded Polystyrene Board (Cavity Wall Insulation):

"Amofoam" • Amoco Foam Products Co.
"Styrofoam" • Dow: The Dow Chemical Co.
"Foamular" • UC Industries, Inc.

Roof Insulation (Base Layer):

ACFoam-II, Atlas Roofing Corporation
FlintBoard ISO, CertainTeed
ENERGY 3 25 PSI, JohnsManville Corporation
Multi-Max FA-3, R-Max

Nailable Roof Insulation (Top Layer):

ACFoam Nail Base, Atlas Roofing Corporation
FlintBoard ISO NB, CertainTeed
Nailable Base-3, R-Max

Closed-Cell Spray Polyurethane Foam Insulation:

WallTite • BASF
HeatLok Soy 200 • Demilec LLC
Froth_Pak • Dow Chemical Company
ProSeal • Icynene Inc.
JM Corbond MCS • Johns Manville

Glass Fiber Thermal Batt Insulation:

Certain Teed Corp.
Manville Building Products
Owens/Corning Fiberglas Corp.

Sound Attenuation Insulation:

CertainTeed
Manville Building Products

INSULATING MATERIALS

General: Provide insulating materials that comply with requirements and with referenced standards.

Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

Extruded Polystyrene Board Insulation: Rigid, cellular polystyrene thermal insulation with closed-cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for type indicated; with 5-year aged R-values of 5.4 and 5 per one inch at 40 and 75 deg F., respectively; and as follows:

Type IV: 1.6 pcf min. density, unless otherwise indicated.
Surface Burning Characteristics: Maximum flame spread and smoke developed values of 75 and 450, respectively.
Size and Thickness: 16" x 96" square edged boards or 48" x 96" scored square edged boards, 2” & 3" thicknesses as shown on the drawings.

Roof Insulation: Closed-cell HCFC free polyisocyanurate foam board manufactured using blowing agent and integrally laminated to heavy non-asphaltic fiber-reinforced felt facers.

Wind Uplift Classification: FM 1-90
Compressive Strength: 20 psi
ASTM C1289 Type V, Grade 2
Fire Resistance Classification: UL Standard 263 (ASTM E119)
Surface Burning Characteristics: Maximum flame spread and smoke developed values of 75 and 450, respectively.
Size and Thickness: 48" x 96" square edged panels, 2.5 inches thick.
“R”” Value: 14.4

Nailable Roof Insulation: Closed-cell HCFC free polyisocyanurate foam board manufactured using blowing agent and bonded to 7/16” thick APA/TECO rated oriented strand board on the top side and a fiber-reinforced felt facer on the bottom.

Wind Uplift Classification: FM 1-90
Compressive Strength: 20 psi
ASTM C1289 Type V, Grade 2
Fire Resistance Classification: UL Standard 263 (ASTM E119)
Surface Burning Characteristics: Maximum flame spread and smoke developed values of 75 and 450, respectively.
Size and Thickness: 48" x 96" square edged panels, 2.5 inches thick.
“R”-Value: 12

Roof Insulation Fasteners: Mechanical fasteners and plates as recommended by insulation manufacturer and Factory Mutual for specified wind uplift rating. Fasteners to be of sufficient length to penetrate both layers of insulation and engage the metal roof deck a minimum of one inch

Closed-Cell Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, minimum density of 2.5 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.0 deg F x h x sq. ft./Btu at 75 deg F.

Air Material Air Leakage Rate: Maximum material air leakage rate of less than 0.004 cfm/ft2 under a pressure differential of 0.3 in w.g. (1.6 psf) per ASTM E 2178 or E 282.

Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

Flame-Spread Index: 25 or less.
Smoke-Development Index: 450 or less.

Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

Compressive Strength: Minimum 40 psi (276 kPa) (ASTM C1029 Type II).

Sustainability Requirements: Provide spray polyurethane foam insulation as follows:

Low Emitting: Insulation tested according to CA/DPH/EHLB/v1.1-2010.
Resistant to fungal growth as per ASTM C1338.
Containing no PBDE

Unfaced Blanket / Batt Insulation: Thermal insulation produced by combining mineral or glass fibers with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and as follows:

Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.

Sound Attenuation Insulation: Unfaced glass fiber acoustical insulation complying with ASTM C 665.

MISCELLANEOUS MATERIALS

Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

EXAMINATION

Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

PREPARATION

Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections that might puncture vapor retarders.

Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces

INSTALLATION, GENERAL

Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.

Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.

Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations.

INSTALLATION OF SPRAY FOAM INSULATION

Install closed-cell spray insulation in cavity of masonry walls in 2-1/2” minimum thickness and locations as shown on the drawings. Install in accordance with manufacturer's guidelines.

Spray insulation to envelop entire area to be insulated and fill all voids. Fill all voids and openings between the top of the CMU cavity walls and the underside of the metal roof decking to provide a complete building envelope enclosure.

Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

Do not apply insulation within 3-inches of heat emitting devices or where the temperature is in excess of 200 degrees F, as per ASTM C411 or in accordance with applicable codes.

INSTALLATION OF ROOF INSULATION & MOISTURE PROTECTION

Examine roof deck for suitability to receive insulation. Verify that substrate is dry, clean and free of foreign material that will damage insulation or impede installation.

Verify that deck is structurally sound to support installers, materials and equipment without damaging or deforming work.

Start of installation indicates installer accepts conditions of existing deck surfaces

Environmental Conditions: Do not install insulation on metal roof deck when water of any type is present. Do not apply roofing materials when substrate is damp or wet.

Install roof insulation over the structural metal roof deck. All insulation shall be installed perpendicular to the roof slope with the long joints parallel to the eave and the end joints staggered. Insulation shall be installed in two layers with the base layer the unfaced insulation board and the top layer the nailable insulation (OSB side at the top). All joints between the two insulation boards shall be staggered. Pressure treated wood nailers or angle iron closures should be provided at all rake and eave conditions to protect the exposed edges of the insulation. **No insulation edges should be directly exposed to weather conditions.**

Roof insulation shall be mechanically attached to the roof deck with Factory Mutual approved fasteners to comply with FM I-90 requirements. Insulation should be secured to roof deck with one (1) mechanical fastener per four (4) square feet of insulation prior to the attachment of the metal roof shingles panels. Insulation and fastening system shall meet Factory Mutual Class 1 windstorm classification I-90. A minimum of 15 fasteners must be installed per 4'x8' board.

Pressure-treated wood nailing strips shall be installed flush with the top of the insulation along the eave and rake edges as shown on the plans. Wood nailers equal to the insulation thickness shall also be installed around any roof openings 18" in length or greater.

Install all roofing materials in accordance with manufacturer's specifications. Do not leave installed insulation exposed to weather. Cover and waterproof with completed roof system immediately after installation.

Temporarily seal exposed insulation edges at the end of each day.

Remove and replace installed insulation that has become wet or damaged with new insulation.

Waterproofing Underlayment: Apply the self-adhering underlayment over the rigid insulation surfacing in accordance with the underlayment manufacturer's specifications. Install underlayment from lower edge up, with at least 3-1/2 inch (75-mm) side laps and 6-inch (100-mm) end laps.

INSTALLATION OF THERMAL BATT INSULATION

Install unfaced batt insulation in walls and ceilings where indicated on the drawings in thicknesses as shown or as needed to achieve the R-value as indicated on the plans. Install insulation to achieve a full enclosure of the room or space being isolated.

INSTALLATION OF SOUND BATT INSULATION

Install sound attenuation insulation in walls where indicated on the drawings in 3 1/2" thicknesses as shown .

PROTECTION

General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where

insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 072500

GYPSUM BOARD WEATHER-RESISTANT BARRIER AND AIR BARRIER SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work of this section includes coated fiberglass-mat gypsum sheathing board system with integral weather-resistant barrier (WRB) and air barrier (AB) features, and all accessory materials required for covering sheathing joints, fasteners, penetrations, rough openings, and material transitions, for use under exterior wall claddings.

B. Fluid-applied membrane air barrier

1.2 RELATED SECTIONS

A. Section 054000 Cold-Formed Metal Framing

B. Section 061000 Rough Carpentry

C. Section 079200 Joint Sealants; sealant materials and installation techniques

D. Section 092900 Gypsum Board

E. Section 074213 Metal Composite Wall Panels

1.3 DEFINITIONS

A. Air Barrier (AB): Air tight barrier made of material that is relatively air impermeable but moisture vapor permeable, with sealed joints and penetrations, and with terminations sealed to adjacent surfaces.

B. Weather-Resistant Barrier (WRB): Water-shedding barrier made of material that is moisture-resistant, installed to shed water, with sealed joints and penetrations, and with terminations sealed to adjacent surfaces.

C. Rough Openings: Openings in the wall to accommodate windows and doors.

D. Material Transitions: Areas where the WRB / AB coated fiberglass-mat gypsum sheathing connects to beams, columns, slabs, parapets, foundation walls, roofing systems, and at the interface of dissimilar materials.

1.4 REFERENCE STANDARDS

A. ASTM C473 Standard Test Method for Physical Testing of Gypsum Panel Products.

B. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

C. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.

D. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

E. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

F. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

G. ASTM E119 Standard Test Method for Fire Tests of Building Construction and Materials.

H. ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 C.

I. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

J. ASTM E2178 Standard Test Method for Air Permeance of Building Materials.

K. ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

L. ICC ES AC212 Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing.

M. AAMA 714 Voluntary Specification for Liquid Applied Flashing Used to Create a Water Resistive Seal Around Exterior Wall Openings in Buildings.

1.5 SUBMITTALS

A. Submittals: Submit in accordance with Division 1 requirements.

B. Product Data and Installation Instructions: Submit manufacturer's product data including sheathing and accessory material types, composition, descriptions and properties, installation instructions and substrate preparation recommendations.

C. Shop Drawings: Submit shop drawings indicating locations and extent of WRB / AB system, including details of typical conditions, special joint conditions, intersections with other building envelope systems and materials; counter flashings and details showing bridging of envelope at substrate changes, details of sealing penetrations, and detailed flashing around windows and doors

D. Test Reports: Submit test reports indicating compliance with specified performance characteristics and requirements

E. Sample warranty: Submit a sample warranty identifying the terms and conditions of the warranty as herein specified.

F. Evaluation reports: Accredited laboratory testing for materials

1.6 WARRANTY

A. Provide manufacturer's standard warranty against in-place exposure damage (delamination, deterioration) for 12 (twelve) months of exposure to normal weather conditions beginning with the date of installation of the product.

B. Provide manufacturer's standard warranty for sheathing to be free of manufacturing defects that make it unsuitable for its intended use. Warranty period shall be Ten (10) years from the date of purchase of the product.

C. Provide manufacturer's standard warranty for use as a drainage plane when the cladding systems are properly designed and installed, with a warranty period of 10 years from the date of purchase of the product or, when used as a substrate in architecturally specified drainage EIFS, 12 years from the date of purchase of the product..

D. Material Warranty: Provide material manufacturer's standard product warranty, for a minimum three (3) years from date of Substantial Completion. SPEC NOTE: VERIFY WARRANTY LENGTH WITH MANUFACTURERS SPECIFIED

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store WRB / AB coated fiberglass mat gypsum sheathing under cover and keep dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack sheathing flat and supported on risers on a flat platform to prevent sagging.

B. Protect fluid applied material, primers and accessory materials from damage, weather, excessive temperatures and construction traffic.

C. Store fluid applied material and primers at temperatures of 40 degrees F or above.

D. Apply fluid applied material to clean surfaces free of contaminants. Chemical residues, surface coatings or films may adversely affect adhesion. Pressure-treated wood and other contaminated surfaces should be cleaned with a solvent wipe before application.

1.8 FIELD CONDITIONS

A. Application standards where applicable are in accordance with Gypsum Association Publication GA-253 for gypsum sheathing and ASTM C1280.

B. Do not install sheathing that is moisture damaged. Indications that panels are moisture damaged include, but not limited to, discoloration, sagging, or irregular shape.

C. Allow installed sheathing to be dry to the touch before sealing joints, penetrations, rough openings, and material transitions.

D. Do not attempt to seal joints, corners, penetrations, rough openings, and material transitions when installed sheathing surface is frozen or has frost on the surface.
E. Do not apply sealing materials to sheathing when air or surface temperature is below 25F for fluid applied materials.
F. Sequencing. Do not install air barrier material before the roof assembly has been sufficiently installed to prevent a buildup of water in the interior of the building.
G. Compatibility. Do not allow air barrier materials to come in contact with chemically incompatible materials.
H. Ultra-violet exposure. Do not expose air barrier materials to sunlight longer than as recommended by the material manufacturer.

PART 2 PRODUCTS

2.1 WEATHER BARRIER ASSEMBLIES

A. Acceptable products: DensElement Barrier System as manufactured by Georgia-Pacific Gypsum LLC.
   1. Sheathing: DensElement Sheathing.
   2. Fluid-applied flashing materials: Fluid-applied flashing as approved by Georgia-Pacific Gypsum LLC.
   3. Primers, backer rods and accessory materials: As approved by Georgia-Pacific Gypsum LLC.
B. System Description: Weather-Resistant Barrier and Air Barrier assembly installed at exterior stud walls under exterior cladding, consisting of the following components as herein specified:
   1. Sheathing: WRB / AB coated fiberglass mat gypsum sheathing.
   2. Fluid-applied flashing to seal sheathing joints, inside and outside corners, penetrations, rough openings, and material transitions.
   3. Backer rods and accessory materials.

2.2 WEATHER-RESISTANT BARRIER (WRB) AND AIR BARRIER (AB) GYPSUM SHEATHING

A. Description: Coated fiberglass mat gypsum sheathing with integral weather-resistant barrier (WRB) and air barrier (AB) complying with applicable requirements of ICC-ES AC212, ASTM E2178, ASTM E2357.
B. Vapor Permeability: When tested as system in accordance with ASTM E96 (water method) the WRB and AB system has a minimum vapor permeance of 20 perms with sealed joints and fasteners.
C. The WRB and Air Barrier Gypsum Sheathing has a moisture absorption rate < 6%
D. Air Barrier performance requirements:
   1. Air permeance of sheathing: Sheathing with an air permeability not greater than 0.001 cfm/ft2 (0.02L/s/m2) when tested in accordance with ASTM E2178.
   2. Air permeance of assembly: Assembly of sheathing and sealing components with an average air leakage not greater than 0.04 cfm/ft2 (0.2L/s/m2) when tested in accordance with ASTM E2357.

2.3 FLUID-APPLIED FLASHING AND ACCESSORY MATERIALS FOR JOINTS, INSIDE AND OUTSIDE CORNERS, FASTENERS, ROUGH OPENINGS, AND MATERIAL TRANSITIONS

A. Substrate requirements:
   1. Sheathing panels should be trimmed to obtain neat fitting joints.

2. Gaps that are more than 1/4” and less than 1” shall be filled with a backer rod to support the fluid applied flashing at the transition joint.
3. For gaps larger than 1" use transition membrane flashing as approved by Georgia-Pacific Gypsum LLC.

B. Fluid applied flashing for panel joints, inside and outside corners, and penetrations
1. Description: STP-based fluid applied flashing.
2. Properties:
   a. Acceptable substrate: Georgia-Pacific Gypsum LLC DensElement Sheathing.
   b. Adhesion to fiberglass mat faced sheathing: No delamination from face of sheathing.
   c. Applied wet film thickness: 16 mils.
   d. Air permeance: meets 0.004 cubic feet per minute per square foot (0.02L/s/sq m), maximum, when tested in accordance with ASTM E2178.
   e. Water vapor permeance: >10 perms (287 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M.
   f. Ultraviolet and weathering resistance: Approved for 12 months weather exposure.
   g. Comply with applicable requirements of AAMA 714
3. Primer: Provide primer in accordance with air barrier manufacturer's written instructions for exposed gypsum core edges.

C. Fluid applied flashing for sealing fasteners:
1. Description: STP-based fluid applied flashing.
2. Properties:
   a. Acceptable substrate: Georgia-Pacific Gypsum LLC DensElement Sheathing.
   b. Adhesion to fiberglass mat faced sheathing: No delamination from face of sheathing.
   c. Applied wet film thickness: 16 mils.
   d. Air permeance: meets 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
   e. Water vapor permeance: >10 perms (287 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M.
   f. Ultraviolet and weathering resistance: Approved for 12 months weather exposure.
   g. Comply with applicable requirements of AAMA 714.

D. Fluid applied flashing for sealing rough openings
1. Fluid applied flashing: STP-based fluid applied flashing.
2. Primer: Liquid primer in accordance with air barrier manufacturer's written instructions for exposed gypsum core edges. Apply primer to raw gypsum board edges by brushing on a thin, uniform coat.
3. Properties:
   a. Acceptable substrate: Georgia-Pacific Gypsum LLC DensElement Sheathing.
   b. Flashing adhesion to fiberglass mat faced sheathing: No delamination from face of sheathing.
   c. Applied wet film thickness: 16 mils.
   d. Flashing air permeance: meets 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
   e. Flashing water vapor permeance: >10 perms (287 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M.
   f. Ultraviolet and weathering resistance: Approved for 12 months weather exposure.

g. Flashing comply with applicable requirements of AAMA 714.

E. Material transitions using fluid applied flashing:

1. Refer to substrate requirements for treatment of gaps as specified herein. Gaps that are more than 1/4” and less than 1” shall be filled with a backer rod to support the fluid applied flashing at the transition joint. For gaps larger than 1" use transition membrane flashing as approved by Georgia-Pacific Gypsum LLC
2. Fluid applied flashing for material transitions:
3. Properties:
   a. Acceptable substrate: Georgia-Pacific Gypsum LLC DensElement Sheathing.
   b. Adhesion to fiberglass mat faced sheathing: No delamination from face of sheathing.
   c. Applied wet film thickness: 16 mils
   d. Air permeance: 0.004 cubic feet per minute per square foot (0.02L/s/sq m), maximum, when tested in accordance with ASTM E2178
   e. Water vapor permeance: >10 perms (287 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M
   f. Ultraviolet and weathering resistance: Approved for 12 months weather exposure
   g. Comply with applicable requirements of AAMA 714

PART 3 EXECUTION

3.1 PREPARATION

A. Remove projections, protruding fasteners, loose or damaged sheathing material at edges of panel that might interfere with proper installation to seal joints, corners, fasteners, penetrations, openings, or material transitions.

B. Wipe down the sheathing surface to receive sealing materials with a clean cloth.

C. Ensure field conditions are met as outlined in Part 1 – General Requirements.

3.2 INSTALLATION OF WEATHER-RESISTANT BARRIER (WRB) AND AIR BARRIER (AB) SHEATHING

A. WRB / AB Coated fiberglass mat sheathing:

1. Install and fasten DensElement Sheathing according to manufacturer’s detailed installation instructions
2. Fastener and penetration treatment: Treat all sheathing fasteners with specified fluid applied flashing used for sealing joints.

3.3 FLUID APPLIED FLASHING FOR SEALING SHEATHING JOINTS, INSIDE AND OUTSIDE CORNERS, FASTENERS, ROUGH OPENINGS, AND MATERIAL TRANSITIONS

A. Sealing DensElement Sheathing Joints using specified Fluid Applied Flashing

1. Apply fluid applied flashing over the joint in a zigzag or ribbon pattern. Cover a minimum of 1” on both sides of the joint.
2. With a straight edge tool, spread evenly over the sheathing joint.
3. Apply at a rate to achieve a minimum wet mil thickness of 16 mils over the entire joint area.

B. Sealing DensElement Sheathing Vertical Corners using specified Fluid Applied Flashing

1. Apply fluid applied flashing over the inside and/or outside corner in a zigzag or ribbon pattern. Cover a minimum of 2” on both sides of the corner.
2. With a straight edge tool, spread evenly over the sheathing corner.

3. Apply at a rate to achieve a minimum wet mil thickness of 16 mils over the corner area.

C. Sealing DensElement Sheathing Fasteners using specified Fluid Applied Flashing: Apply the fluid applied flashing material to fasteners and wipe down with a straight edge tool; provide a minimum 16 mil thick coating over the fastener.

D. Sealing DensElement Sheathing Rough Openings using specified Fluid Applied Flashing
1. Apply a bead of DensDefy™ Liquid Flashing into all inside corners of the opening.
2. Apply DensDefy™ Liquid Flashing in the opening sill, jamb and header in a zig-zag or ribbon pattern.
3. Apply DensDefy™ Liquid Flashing over the DensElement Sheathing adjacent to the opening sill, jamb and header in a zig-zag or ribbon pattern.
4. Use a straight edge tool to spread the DensDefy™ Liquid Flashing to a pinhole void free application achieving a minimum 16 wet mils
5. Spread the DensDefy™ Liquid Flashing a minimum of 2” into the rough opening and a minimum 1” past the interior air seal of the window unit. Refer to the project details and specifications to determine window placement and minimum requirement for rough opening treatment.
6. Ensure a minimum 2” of DensDefy™ Liquid Flashing is applied onto the sheathing surface adjacent to the opening.

E. Sealing DensElement sheathing material transitions using specified Fluid Applied Flashing
1. Sheathing joint and transition gaps to receive fluid-applied flashing shall be less than 1/4" (6.4 mm).
2. For gaps larger than 1/4" use shall be sealed with fluid-applied flashing as approved by Georgia-Pacific Gypsum, LLC
3. Gaps that are more than 1/4” and less than 1” shall be filled with a backer rod to support the fluid applied flashing at the transition joint.
4. If necessary, prime the adjacent material with primer per the material manufacturer’s recommendations.
5. Apply fluid applied flashing over the sheathing and adjacent material in a zigzag or ribbon pattern. Ensure the flashing is a minimum of 2” on each substrate material surface.
6. With a straight edge tool, spread fluid applied flashing over material transition joint.
7. Apply at a rate to achieve a minimum wet mil thickness of 16 mils.

3.4 SEALING EXTERIOR WALL PENETRATIONS

A. Exterior wall penetration shall be sealed to prevent air and water infiltration. Penetrations may be sealed with fluid applied flashing.

B. For round or square pipe/duct penetrations use specified fluid applied flashing, refer to DensElement Barrier System Technical Guide for instructions for proper sealing.

3.5 FIELD QUALITY CONTROL

A. Do not cover installed WRB / AB assembly until required inspections have been completed and installation has been accepted.

B. Where applicable, allow for owner’s inspection and air barrier testing and reporting.

3.6 PROTECTION

A. Protect WRB / AB assembly from damage during installation and during the construction period.

END OF SECTION

SECTION 074213

METAL COMPOSITE MATERIAL WALL PANELS.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes MCM wall panels.

1.3 DEFINITIONS

A. DBVR: Drained and back-ventilated rainscreen system; rainscreen system designed to drain and dry cavity entering water through drainage channels, weeps, and air ventilation.

B. MCM: MCM; cladding material formed by joining two thin metal skins to polyethylene or fire-retardant core and bonded under precise temperature, pressure, and tension.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**

1. Meet with Owner, Architect, Owner's insurer if applicable, MCM panel Fabricator and Installer, MCM sheet manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects MCM panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
4. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect MCM panels.
5. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
6. Review temporary protection requirements for MCM panel assembly during and after installation.
7. Review procedures for repair of panels damaged after installation.
8. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of MCM panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches

C. Samples for Initial Selection: For each type of MCM panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. MCM Panels: 12 inches long by actual panel width. Include fasteners, closures, and other MCM panel accessories. Submit custom color samples in paint manufacturer's standard size.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

1. MCM Manufacturer's Material Test Reports: Certified test reports showing compliance with specific performance or third-party listing documenting compliance to comparable code sections IBC 1407.14 and IBC 1703.5.
2. MCM System Fabricator's Certified System Tests Reports: Certified system test reports showing system compliance with specific performance or third-party listing documenting compliance code section. Base performance requirements on MCM system type provided.

a. Wet System: Tested to AAMA 501.
b. DBVR System: Tested to AAMA 509.
c. PER System: Tested to AAMA 508.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For MCM panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by MCM Fabricator.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for MCM fabrication and installation.

1. Build mockup of typical MCM panel assembly, including **corner, soffits if any, supports, attachments, and accessories**.
2. Water-Spray Test: Conduct water-spray test of mockup of MCM panel assembly, testing for water penetration in accordance with AAMA 501.2.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, MCM panels, and other manufactured items so as not to be damaged or deformed. Package MCM panels for protection during transportation and handling.

B. Unload, store, and erect MCM panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack MCM panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store MCM panels to ensure dryness, with positive slope for drainage of water. Do not store MCM panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on MCM panels during installation.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of MCM panels to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.11 COORDINATION

A. Coordinate MCM panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Warranty on Panel Material: Manufacturer's standard form in which manufacturer agrees to replace MCM that fails within specified warranty period.

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

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace MCM panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: [**20**] [**10**] [**Five**] years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide MCM panel systems capable of withstanding the effects of the following loads, based on testing in accordance with ASTM E330:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings or min. 25 PSF.
3. Panel Deflection Limit: For wind loads, no greater than 1/60 of the span
4. Framing Member Deflection Limits: For wind loads, no greater than 1/360 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. of wall area when tested in accordance with ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft.

C. Water Penetration under Static Pressure: No water penetration to room side of assembly when tested for 15 minutes in accordance with ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft.

D. Thermal Movements: Locate expansion and contraction points to allow for free and noiseless thermal movements from surface temperature changes.

1. Temperature Change (Range): minus 20 deg F to 180 deg F material surfaces.

E. Fire Propagation Characteristics: MCM wall assembly passes NFPA 285 testing.

2.2 MCM WALL PANELS <**Insert drawing designation**>

A. MCM Wall Panel Systems: Provide factory-formed and -assembled, MCM wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components[**, panel stiffeners**], and accessories required for weathertight system.

1. Basis-of-Design Product: Subject to compliance with requirements, provide ALUCOBOND®; 3A Composites USA Inc.; ALUCOBOND® PLUS or comparable product by:
   a. <**Insert manufacturer's name**>.

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch thick, coil-coated aluminum sheet facings.

1. Panel Thickness: 0.157 inch.
2. Core: Fire retardant.

3. Exterior Finish: **PVDF fluoropolymer** or **FEVE fluoropolymer**.

   a. Color: **As selected by Architect from manufacturer's full range**.

   b. Peel Strength: 22.5 in-lb/in. when tested for bond integrity in accordance with ASTM D1781.

4. Fire Performance: Flame spread less than 25 and smoke developed less than 450, in accordance with ASTM E84.

C. Attachment Assembly Components: Formed from **extruded aluminum**.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide Fabricator's standard sections as required for support and alignment of MCM panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of MCM panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as MCM panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent MCM panels.

1. Basis-of-Design Product: Subject to compliance with requirements, provide ALUCOBOND®; 3A Composites USA Inc.; ALUCOBOND® Axcent™ Trim or comparable product by one of the following:

   a. Arconic Architectural Products (USA).
   b. Mitsubishi Chemical Composites.
   c. Prior approved equal.

2. Aluminum Trim: Formed with 0.040-inch thick, coil-coated aluminum sheet facings.
3. Color: **As selected by Architect from manufacturer's full range**

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of MCM panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in MCM panels and remain weathertight; and as recommended in writing by MCM panel manufacturer.

2.4 FABRICATION

A. General: Fabricate and finish MCM panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements

demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate MCM panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations or recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:

1. PVDF Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. FEVE Fluoropolymer: AAMA 2605. One-coat **tinted** fluoropolymer finish containing 100 percent fluorinated ethylene vinyl ether resin in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, MCM panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by MCM wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by MCM wall panel manufacturer.

    a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and assemblies penetrating MCM panels to verify actual locations of penetrations relative to seam locations of MCM panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install sub-framing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and MCM panel manufacturer's written recommendations.

3.3 MCM PANEL INSTALLATION

A. General: Install MCM panels in accordance with Fabricator's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor MCM panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving MCM panels.
2. Flash and seal MCM panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by MCM panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as MCM panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of MCM panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by MCM panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support MCM wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

E. Panel Installation: Attach MCM wall panels to supports at locations, spacings, and with fasteners recommended by Fabricator to achieve performance requirements specified.

1. Wet Seal Systems: Seal horizontal and vertical joints between adjacent MCM wall panels with sealant backing and sealant. Install sealant backing and sealant in accordance with requirements specified in Section 079200 "Joint Sealants."

    a. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended in writing by Fabricator. Attach routed-and-returned flanges of wall panels to panel clips with Fabricator's standard fasteners.
    b. Panel Installation:

        1) Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant in accordance with requirements specified in Section 079200 "Joint Sealants."
        2) Seal horizontal and vertical joints between adjacent MCM wall panels with Fabricator's standard gaskets.
        3) Joint Sealing: Seal all joints in accordance with AAMA 501.

2. PER Installation: Install using Fabricator's standard assembly with vertical channel that provides support and secondary drainage assembly, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach MCM wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.
    a. Track-Support Installation: Install support assembly at locations, spacings, and with fasteners recommended by Fabricator. Use Fabricator's standard horizontal tracks and vertical [**tracks**] [**drain channels**] that provide support and secondary drainage assembly, draining to the exterior at horizontal joints through drain tube. Attach MCM wall panels to tracks by interlocking panel edges with Fabricator's standard "T" clips.
    b. Panel Installation:
        1) Attach routed-and-returned flanges of wall panels to perimeter extrusions with Fabricator's standard fasteners.
        2) Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
    c. Joint Sealing: Seal all joints in accordance with AAMA 508. Do not apply sealants to joints unless indicated.
3. DBVR System: Install using Fabricator's standard assembly with vertical channel that provides support and secondary drainage assembly, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by Fabricator. Attach MCM wall panels by inserting horizontal support pins into notches in

vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.

a. Track-Support Installation: Install support assembly at locations, spacings, and with fasteners recommended by manufacturer. Use Fabricator's standard horizontal tracks and vertical [**tracks**] [**drain channels**] that provide support and secondary drainage assembly, draining to the exterior at horizontal joints through drain tube. Attach MCM wall panels to tracks by interlocking panel edges with Fabricator's standard "T" clips.

b. Panel Installation:

1) Attach routed-and-returned flanges of wall panels to perimeter extrusions with manufacturer's standard fasteners.

2) Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.

c. Joint Sealing: Seal all joints in accordance with AAMA 509. Do not apply sealants to joints unless otherwise indicated.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete MCM panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by MCM panel Fabricator; or, if not indicated, provide types recommended in writing by MCM system Fabricator.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, or SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant.

3.4 ERECTION TOLERANCES

A. Site Verifications of Conditions:

1. Verify conditions of substrate previously installed under other Sections are acceptable for the MCM system installation. Provide documentation indicating detrimental conditions to the MCM system performance.
2. Once conditions are verified, MCM system installation tolerances are as follows:

a. Shim and align MCM wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 FIELD QUALITY CONTROL

A. Water-Spray Test: After installation, test area of assembly **as directed by Architect** for water penetration in accordance with AAMA 501.2.

B. Fabricator's Field Service: Engage a factory-authorized service representative to test and inspect completed MCM wall panel installation, including accessories.

C. MCM wall panels will be considered defective if they do not pass test and inspections.

D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as MCM panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of MCM panel installation, clean finished surfaces as recommended by MCM panel manufacturer. Maintain in a clean condition during construction.

B. After MCM panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace MCM panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213

SECTION 075423
THERMOPLASTIC MEMBRANE ROOFING (TPO)

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes
   1. Thermoplastic Polyolefin Single-Ply Roofing Membrane
   2. Thermoplastic Polyolefin Flashings
   3. Thermoplastic Polyolefin Accessories
   4. Roof Insulation

B. Related Sections
   1. Section 06100: Rough Carpentry
   2. Section 07620: Sheet Metal Flashing and Trim

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM) - *Annual Book of ASTM Standards*
   1. ASTM D-751 – Standard Test Methods for Coated Fabrics
   2. ASTM D-2137 - Standard Test Methods for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics
   3. ASTM E-96 - Standard Test Methods for Water Vapor Transmission of Materials
   4. ASTM D1204 - Standard Test Method for Linear Dimensional Changes of Non-Rigid Thermoplastic Sheeting or Film at Elevated Temperature
   5. ASTM D-471 - Standard Test Method for Rubber Property—Effect of Liquids
   6. ASTM D-1149 - Standard Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment
   7. ASTM C-1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
   8. ASTM C-1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
   9. ASTM E 903 – Standard Test Method for Solar Absorptance, Reflectance, and Transmission of Materials Using Integrating Spheres

B. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - *Architectural Sheet Metal Manual*

C. National Roofing Contractors Association (NRCA)

F. Factory Mutual (FM Global) - *Approval Guide*

G. Underwriters Laboratories (UL) - *Roofing Systems and Materials Guide* (TGFU R1306)

I. ENERGY STAR

J. Cool Roof Rating Council (CRRC)

1.03 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) *Roofing and Waterproofing Manual* for definitions of roofing terms related to this section.

1.04 SUBMITTALS

A. Product Data: Provide product data sheets for each type of product indicated in this section.

B. Shop Drawings: Provide manufacturers standard details and approved shop drawings for the roof system specified.

C. Samples: Provide samples of insulations, fasteners, membrane materials and accessories for verification of quality.

D. Certificates: Installer shall provide written documentation from the manufacturer of their authorization to install the roof system, and eligibility to obtain the warranty specified in this section.

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Roofing manufacturer shall provide a roofing system that meets or exceeds all criteria listed in this section.

B. Installer's Qualifications:
   1. Installer shall be certified by the roofing manufacturer.

C. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary roofing manufacturer.

D. Final Inspection: Manufacturer's representative shall provide a comprehensive final inspection after completion of the roof system. All application errors must be addressed and final punch list completed.

1.06 PRE-INSTALLATION CONFERENCE

A. Prior to scheduled commencement of the roofing installation and associated work, conduct a meeting at the project site with the installer, architect, owner, roofing representative and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to roofing work.

1.07 PERFORMANCE REQUIREMENTS

A. Provide an installed roofing membrane and base flashing system that does not permit the passage of water, and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.

B. Roofing manufacturer shall provide all primary roofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.

1.08 REGULATORY REQUIREMENTS

A. All work shall be performed in a safe, professional manner, conforming to all federal, state and local codes.

B. Windstorm Classification: Provide a roofing system which will achieve a Factory Mutual 1-90 wind uplift rating, as listed in the current FM Approval Guide.

1.09 DELIVERY, STORAGE AND HANDLING

A. Deliver all roofing materials to the site in original containers, with factory seals intact. All products are to carry roofing manufacturer's label.

B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range. Reference data sheets for product storage requirements.

C. Do not expose materials to moisture in any form before, during or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.

D. Use “breathable” type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material will be installed.

1.10 PROJECT CONDITIONS

A. Weather
   1. Proceed with roofing only when existing and forecasted weather conditions permit.
   2. Ambient temperatures must be above 45°F (7.2°C) when applying hot asphalt or water-based adhesives.

1.11 WARRANTY/GUARANTEE

A. Provide manufacturers standard prorated material warranty
   1. The manufacturer agrees to repair or replace the portion of the roofing materials that have resulted in a leak due to a manufacturing defect or defects caused by ordinary wear and tear.
      a) Duration: 20 Years
B. Provide roofing contractor’s installation warranty
   1. The roofing contractor agrees to repair leaks in the roofing system due to installation defects not associated with ordinary wear and tear.
      a) Duration: 5 Years

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS & PRODUCTS

A. Carlisle Syntec • Sure-Weld TPO
B. GAF® • EverGuard TPO (*Guide Specification)
C. Firestone • UltraPly TPO
D. Johns Manville • JM TPO SA

2.02 AIR AND VAPOR RETARDER SYSTEM

A. Proprietary formulated elastomeric styrene-butadiene-styrene (SBS) polymer modified bitumen in combination with a high tack self-adhesive, **GAF SA Vapor Retarder** by GAF.

2.03 INSULATION

A. Rigid polyisocyanurate board, with a strong white or black fibrous glass facer
   1. **EnergyGuard™ Polyiso Insulation** by GAF®,
      a) Board Thickness: 1 1/2” Minimum Thickness
      b) Thermal Resistance (LTTR value) of: 5.7 Minimum R-Value Per Inch Thickness
      c) Compressive Strength: 20 PSI, meets ASTM C1289, Type II, Class 1, Grade 2.

2.05 ROOF COVER BOARD/RECOVER BOARD

A. High-density fiberboard roof insulation with unique, patent-pending, non-asphaltic primed red coating that allows for a solid membrane bond and meets ASTM C208, Type II, Grade 1 and Grade 2, **STRUCTODEK® HD Fiberboard** by Blue Ridge FiberBoard®
   a) Compressive Strength: 15 lbf/in² (103 kPa) minimum
   b) Board Thickness: 1/2”
   c) Thermal Resistance (R value) of: 1.3 (for 1/2”)

2.07 MEMBRANE MATERIALS

A. A smooth type, polyester scrim reinforced thermoplastic polyolefin membrane, for use as a single ply roofing membrane. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed, FM Approved, Dade County Product Approval, Florida Building Code Approved.
   1. **EverGuard® TPO**
      a) Thickness: 60mil

b) Color: White - Energy Star Listed, CRRC Listed and Title 24 Compliant.

2.08 FLASHING MATERIALS

A. Advanced heat and UV protected, smooth type, polyester scrim reinforced thermoplastic polyolefin membrane, for use as a single ply roofing membrane. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed, FM Approved, Dade County Product Approval, Florida Building Code Approved.
   1. **EverGuard® TPO;**
      a) Thickness: 60mil
      b) Color: White - Energy Star Listed, CRRC Listed and Title 24 Compliant.

2.09 ADHESIVES, SEALANTS and PRIMERS

A. Solvent-based bonding adhesive for use with smooth TPO membranes, **EverGuard® SBA 1121 Bonding Adhesive**, by GAF®.

B. Solvent based primer for preparing surfaces to receive butyl based adhesive tapes, **EverGuard® TPO Primer**, by GAF®.

C. Solvent based seam cleaner used to clean exposed or contaminated seam prior to heat welding, **EverGuard® TPO Seam Cleaner,** by GAF®.

D. Solvent based, trowel grade synthetic elastomeric sealant. Durable and UV resistant suitable for use where caulk is typically used. Available in 10 oz. tubes, **FlexSeal™ Caulk Grade Sealant** by GAF®.

E. Commercial grade roofing sealant suitable for sealing the upper lip of exposed termination bars and penetrations and around clamping rings and comes with a 20 yr. ltd warranty against leaks caused by manufacturing defects. Meets the performance criteria of ASTM D412, ASTM D2196, ASTM D1475 and ASTM D1644, **FlexSeal™** Roof Sealant, by GAF®.

F. One-part moisture cure, self-leveling sealant designed for use in pitch pans **EverGuard® One-Part Pourable Sealer** by GAF®.

G. One part butyl based high viscosity sealant suitable for sealing between flashing membrane and substrate surface behind exposed termination bars and for sealing between roofing membrane and drain flange. **EverGuard® Water Block**, by GAF®.

H. Solvent based liquid, required to protect field cut edges of EverGuard® TPO membranes. Applied directly from a squeeze bottle, **EverGuard® TPO Cut Edge Sealant**, by GAF®.

2.10 PLATES & FASTENERS

A. **Drill•Tec™ Standard Screws**: Standard duty alloy steel insulation fastener with CR-10 coating with a .215" diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips head for use on steel and wood decks.
B. **Drill•Tec™ HD Screws**: Heavy gauge alloy steel fastener with CR-10 coating with a .245" diameter thread. Miami Dade and Factory Mutual Standard 4470 Approved, #3 Phillips truss head for use on wood, concrete and steel decks.
C. **Drill•Tec™ Insulation Plates**: Galvalume, 3" (76 mm) diameter, suitable for use with Drill•Tec™ Standard and HD screws.

2.12 ACCESSORIES

A. GENERAL FLASHING ACCESSORIES
   1. A smooth type, unreinforced thermoplastic polyolefin based membrane for use as an alternative flashing/reinforcing material for penetrations and corners. Required whenever preformed vent boots cannot be used, available in White, 0.055 inches (55 mils) nominal thickness and sheet size: 24in x 50ft. **EverGuard® TPO Detailing Membrane**, by GAF®.

2. An 8 inch (203 mm) wide smooth type, polyester scrim reinforced thermoplastic polyolefin membrane strip for use as a cover strip over coated metal and stripping-in coated metal flanges and general repairs: 0.045 inches (45 mils) nominal thickness with 100 foot length, available in White, **EverGuard® TPO Flashing Membrane**, by GAF®.

3. 25 mil TPO membrane laminated to galvanized sheet metal for fabrication into metal gravel stop and drip edge profiles, metal base and curb flashings, sealant pans, and scupper sleeves. **EverGuard® TPO Coated Metal**, by GAF®.
   a) Metal type: 20 Gauge Aluminum
   b) Sheet Color: White

4. Extruded aluminum termination bar with angled lip caulk receiver and lower leg bulb stiffener. Pre-punched slotted holes at 6” on center or 8” on center. ¾” x 10’ with 0.090” cross section, **DRILL-TEC™ Termination Bar,** by GAF®.

B. ROOF EDGE ACCESSORIES
1. Two-part assembly with a continuous cleat and a formed high-quality KYNAR 500® finish cover tested per ANSI/SPRI/FM4435/ES-1. The system shall have all concealed fasteners with no penetration on horizontal roof surface available in 10' lengths, **EverGuard® Standard Drip Edge** by GAF®.

D. PENETRATION ACCESSORIES
1. 0.075” thick molded TPO membrane sized to accommodate most common pipe and conduits, (1” (25.4 mm) to 6” diameter pipes), including square tube. Hot-air welded directly to EverGuard® TPO membrane, supplied with stainless steel clamping rings, **EverGuard® TPO Preformed Vent Boots** by GAF®.

2. 0.045” or 0.60” thick molded TPO membrane preformed boots are split to accommodate most common pipes and conduits and available in three standard sizes, **EverGuard® TPO Split Pipe Boots**, by GAF®.

3. 0.045” or 0.60” thick molded TPO membrane preformed square boots are split to accommodate most common square penetrations and conduits and available in three standard sizes, **EverGuard® TPO Square Tube Wraps**, by GAF®.

4. .070 thick molded penetration pocket to provide structure and foundation for the application of a pourable sealant for a variety of roof penetrations, weldable and 9" x 6" x 4" (l x w x h). **EverGuard® TPO Pourable Sealer Pocket**

5. 055” thick smooth type, unreinforced thermoplastic polyolefin membrane designed for use as a conforming membrane seal over T-joints in 60 and 80 mil membrane applications. **EverGuard® TPO Drain** by GAF®

E. FIELD OF ROOF ACCESSORIES
1. 1/8” thick extruded and embossed TPO roll 30” x 50’, heat welds directly to roofing membrane. Unique herringbone traction surface. Gray in color, **EverGuard® TPO Walkway Rolls**, GAF®.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that the surfaces and site conditions are ready to receive work.

B. Verify that the deck is supported and secured.

C. Verify that the deck is clean and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters.

D. Verify that the deck surfaces are dry and free of ice or snow.

E. Verify that all roof openings or penetrations through the roof are solidly set, and that all flashings are tapered.

3.02 SUBSTRATE PREPARATION

B. Steel Deck

1. Metal decks must be a minimum uncoated thickness of 22 gauge (0.8 mm) and shall have a G-90 galvanized finish on all panels. FM requirements may supersede those set forth in this section. Consult the current FM Guide for more information.
2. Decks must comply with the gauge and span requirements in the current Factory Mutual FM Approval Guide and be installed in accordance with Loss Prevention Data Sheet 1-28 or specific FM approval.
3. When re-roofing over steel decks, surface corrosion shall be removed, and repairs to severely corroded areas made. Loose or inadequately secured decking shall be fastened, and irreparable or otherwise defective decking shall be replaced.

3.03 NAILER INSTALLATION

A. Acceptable Material

1. Solid Blocking: Non-pressure-treated wood as required, #2 Grade or better, nominal 1 1 /4" (30 mm) x 4" (102 mm) with a minimum thickness of 3 1 /2" (88 mm).
2. Shim Material: Plywood, 1 /2" (13 mm) x width to match solid blocking.
3. Verify the condition of existing roof nailers and anchor to resist 250 lb. per ft. (550 kg) load applied in any direction. New nailers should meet same load requirements.
4. DRILL-TEC™ HD screws 18" (457 mm) o.c. attachment to structural wood, steel decks with a 1" (25 mm) thread embedment.
5. Three anchors per length of wood nailer minimum.

3.04 INSTALLATION - GENERAL

A. Install GAF®'s EverGuard® TPO roofing system according to all current application requirements in addition to those listed in this section.

B. Start the application of membrane plies at the low point of the roof or at the drains, so that the flow of water is over or parallel to, but never against the laps.

3.05 AIR/VAPOR BARRIER

A. GENERAL

1. Air/vapor retarder components must typically be installed when required by design professional to address internal building air pressure or humidity conditions on the structural deck or directly over a minimal layer of EnergyGuard™ insulation or fire barrier.
2. EnergyGuard™ insulation must be installed over the vapor retarder to raise the location of the dew point temperature above the level of the vapor retarder.
3. Designers should consider requiring air retarders:
   a) On all air porous decks, with openings in the walls or area directly below the roof deck that exceeds 10% of the total wall area.
   b) When the internal pressurization of the building is in excess of 5 lbs. per sq. ft. (239 Pa).
   c) When the building height exceeds 50 ft. (30.5 m).
   d) When buildings have large openings or overhangs.

e) In conditions where positive internal pressure is applied suddenly, as may be the case at aircraft hangers or distribution centers—otherwise, the roofing system may fail due to pressure impact.

4. Refer to FM Global Loss Prevention Data Sheets 1-28 and 1-29 for specific installation procedures for all roofs with large openings.
5. For roofs to be guaranteed by GAF:
   a) Air retarders are required for all extended-length guarantees on buildings where large wall openings greater than 10% of the total wall area can be open during a windstorm, including opening due to storm damage.

B. APPLICATION – LOOSE-APPLIED

1. Install air/vapor barrier sheet loose-applied to the deck or fire board so that wrinkles and buckles are not formed.
2. Overlap air/vapor barrier sheets a minimum of 6" for side and end laps. Tape laps together with duct tape or double-sided tape.
3. Seal perimeter and penetration areas with foam sealant.
4. Seal all perimeter nailers with adhered roof membrane placed over the nailer and covering the exterior face of the nailer by 1" (25 mm).
5. Install insulation boards over the air/vapor retarder and mechanically attach the boards to the deck.

3.06 INSULATION

A. GENERAL

1. Do not apply roof insulation or roofing until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment. A vapor retarder coated lightly with asphalt may be applied to protect the inside of the structure prior to the insulation and final roofing installation. Before the application of the insulation, any damage or deterioration to the vapor retarder must be repaired.
2. Do not install wet, damaged or warped insulation boards.
3. Install insulation boards with staggered board joints in one direction (unless taping joint).
4. Install insulation boards snug. Gaps between board joints must not exceed ¼” (6 mm). All gaps in excess of ¼” (6 mm) must be filled with like insulation material.
5. Wood nailers must be 3-1/2” (89 mm) minimum width or 1” (25.4 mm) wider than metal flange. They shall be of equal thickness as the insulation, and be treated for rot resistance. All nailers must be securely fastened to the deck.
6. Do not kick insulation boards into place.
7. Miter and fill the edges of the insulation boards at ridges, valleys and other changes in plane to prevent open joints or irregular surfaces. Avoid breaking or crushing of the insulation at the corners.
8. Insulation should not be installed over new lightweight insulating concrete.
9. Roof tape, if required over insulation joints, must be laid evenly, smoothly and embedded in a uniform coating of hot steep asphalt with 4” (102 mm) end laps. Care must be taken to assure smooth application of tape, and full embedment of the tape in the asphalt.
10. Do not install any more insulation than will be completely waterproofed each day.
11. Do NOT install insulation boards that are wet, warped, or buckled; they must be discarded. Insulation boards that are broken, cracked, or crushed shall not be installed unless the damaged area is first removed and discarded.
12. Remove and replace insulation boards that become wet or damaged after installation.
13. Install no more insulation than can be properly covered by the end of each day with roofing membrane.

B. INSULATION APPLICATION

1. The insulation must be securely attached to the roof deck. A minimum FMRC 1-60 attachment is recommended. Refer to FMRC Approval Guide for FM fastening patterns. Factory Mutual requires fastener density increased in corner areas for FM 1-60 as well as perimeter and corner area fastener density increases for FM 1-90 or greater. Refer to FM Loss Prevention Data Sheets 1-7, 1-28, and 1-49.
2. Use only fasteners with a minimum 3 inch (76 mm) stress plate when mechanically attaching insulation. Do not attach insulation with nails.

3.07 MEMBRANE APPLICATION

A. GENERAL

1. Substrates must be inspected and accepted by the contractor as suitable to receive and hold roof membrane materials.
2. Place roof membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent securement.
3. Membrane that has been exposed for more than 12 hours or has become contaminated will require additional cleaning methods.
   a) Light Contamination - Membrane that has been exposed overnight up to a few days to debris, foot traffic, or dew or light precipitation can usually be cleaned with a white cloth moistened with EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner, a low-VOC cleaner) for TPO membranes.
   b) Dirt-Based Contamination - Membrane that is dirt encrusted will require the use of a low-residue cleaner, such as Formula 409® and a mildly abrasive scrubbing pad to remove the dirt. This must be followed by cleaning with a white cloth moistened with EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner) for TPO membranes. Be sure to wait for solvent to flash off prior to welding.
   c) Exposure-Based Contamination - Membrane that is weathered or oxidized will require the use of EverGuard® TPO Cleaner, EverGuard® CleanWeld™ Conditioner, and a mildly abrasive scrubbing pad to remove the weathered/oxidized top surface layer. This must be followed by cleaning with a white cloth moistened with EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner) for TPO membranes. Unexposed membrane left in inventory for a year or more may need to be cleaned as instructed above. Be sure to wait for solvent to flash off prior to welding.
   d) Chemical-Based Contamination - Membrane that is contaminated with bonding adhesive, asphalt, flashing cement, grease and oil, and most other contaminants usually cannot be cleaned sufficiently to allow an adequate heat weld to the membrane surface. These membranes should be removed and replaced.

A. FULLY ADHERED

1. All work surfaces should be clean, dry, and free of dirt, dust, debris, oils, loose and/or embedded gravel, un-adhered coatings, deteriorated membrane, and other contaminants that may result in a surface that is not sound or is uneven.
2. Full-width rolls can be installed throughout the field and perimeter of the roof. Half sheets are not necessary.
3. Overlap roof membrane a minimum of 3" (76 mm) for end laps. For fleece-back membrane, butt ends together and cover joint with 8” (203 mm) wide EverGuard Flashing Strip heat-welded. Membranes are provided with lap lines along the side laps.
4. Best practice is to install membrane so that the side laps run across the roof slope lapped toward drainage points.
5. All exposed sheet corners must be rounded a minimum of 1" (25 mm).
6. Use full-width rolls throughout the field and perimeter of the roof. Half sheets are not necessary.
7. Membrane laps shall be heat-welded together. All welds shall be continuous, without voids or partial welds. Welds shall be free of burns and scorch marks.

8. Weld shall be a minimum of 1” (25.4 mm) in width for automatic machine welding and a minimum 2” in width for hand welding,
9. Roof membrane must be mechanically attached along the base of walls with screws and plates 6” (152 mm) on center.
10. Adhesives should be applied to membrane at the rates listed on the pail.
11. Use appropriate bonding adhesive for substrate surface, applied with a solvent-resistant roller, brush or squeegee
12. Adhere approximately one half of the membrane sheet at a time. One half of the sheet's length shall be folded back in turn to allow for adhesive application. Lay membrane into adhesive once the bonding adhesive is tacky to the touch.
13. Roll membrane with a weighted roller to ensure complete bonding between adhesive and membrane.
14. Prevent seam contamination by keeping the adhesive application a few inches back from the seam area.

3.08 FLASHINGS

A. GENERAL

1. All penetrations must be at least 24” (610 mm) from curbs, walls, and edges to provide adequate space for proper flashing.
2. Flash all perimeter, curb, and penetration conditions with coated metal, membrane flashing, and flashing accessories as appropriate to the site condition.
3. All coated metal and membrane flashing corners shall be reinforced with preformed corners or non-reinforced membrane.
4. Heat-weld all flashing membranes, accessories, and coated metal. A minimum 2” (52 mm) wide hand weld or minimum 1” (25 mm) to 1-1/2" (39 mm) automatic machine weld is required.
5. Consult the EverGuard® *Application and Specifications Manual* or GAF® Technical Support Services for more information on specific construction details, or those not addressed in this section.
6. EverGuard Extreme® flashings and accessories are required for use with EverGuard Extreme® membranes.

B. COATED METAL FLASHINGS

1. Coated metal flashings shall be formed in accordance with current EverGuard® construction details and SMACNA guidelines.
2. Coated metal sections used for roof edging, base flashing and coping shall be butted together with a ¼” (7 mm) gap to allow for expansion and contraction. Heat-weld a 6” (152 mm) wide reinforced membrane flashing strip to both sides of the joint, with approximately 1” (25.4 mm) on either side of the joint left un-welded to allow for expansion and contraction. 2” (52 mm) wide aluminum tape can be installed over the joint as a bond-breaker, to prevent welding in this area.
3. Coated metal used for sealant pans, scupper inserts, corners of roof edging, base flashing and coping shall be overlapped or provided with separate metal pieces to create a continuous flange condition, and pop-riveted securely. Heat-weld a 6” (152 mm) wide reinforced membrane flashing strip over all seams that will not be sealed during subsequent flashing installation.
4. Provide a ½” (13 mm) hem for all exposed metal edges to provide corrosion protection and edge reinforcement for improved durability.
5. Provide a ½” (13 mm) hem for all metal flange edges whenever possible to prevent wearing of the roofing and flashing membranes at the flange edge.
6. Coated metal flashings shall be nailed to treated wood nailers or otherwise mechanically attached to the roof deck, wall or curb substrates, in accordance with construction detail requirements.

C. REINFORCED MEMBRANE FLASHINGS

1. The thickness of the flashing membrane shall be the same as the thickness of the roofing membrane.
2. Membrane flashing may either be installed loose or fully adhered to the substrate surface in accordance with “Construction Detail Requirements”.
3. Apply the adhesive only when outside temperature is above 40°F. Recommended minimum application temperature is 50°F to allow for easier adhesive application. Water-based adhesives are approved for use with smooth TPO membranes for flashings only
4. The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.
5. Please note that solvent-based adhesives must be allowed to dry until tacky to the touch before mating flashing membrane. Water-based adhesive must be allowed to flash off completely.
6. Heat-weld all laps in EverGuard® smooth-reinforced flashing membrane in accordance with heat-welding guidelines. All seams in fleece-back membrane and smooth field sheet must be stripped in with 8" (203 mm) flashing strip.
7. For extended length guarantees, separate counter flashing is required; exposed termination bars are not acceptable

D. UN-REINFORCED MEMBRANE FLASHINGS
1. Un-reinforced membrane is used to field-fabricate penetration or reinforcement flashings in locations where preformed corners and pipe boots cannot be properly installed.
2. Penetration flashings constructed of un-reinforced membrane are typically installed in two sections, a horizontal piece that extends onto the roofing membrane and a vertical piece that extends up the penetration. The two pieces are overlapped and hot-air welded together.
3. Apply the adhesive only when outside temperature is above 40°F. Recommended minimum application temperature is 50°F to allow for easier adhesive application. Water-based adhesives are approved for use with smooth TPO membranes for flashings only
4. The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.
5. Please note that solvent-based adhesives must be allowed to dry until tacky to the touch before mating flashing membrane. Water-based adhesive must be allowed to flash off completely.

E. ROOF EDGES
1. Roof edge flashings are applicable for gravel stop and drip edge conditions as well as for exterior edges of parapet walls.
2. Flash roof edges with coated metal flanged edging with a minimum 3" (76 mm) wide flange nailed 4" (102 mm) on center to wood nailers, and heat weld 8” (203 mm) membrane strip to metal flanges.
3. When the fascia width exceeds 4” (102 mm), coated metal roof edging must be attached with a continuous cleat to secure the lower fascia edge. The cleat must be secured to the building no less than 12” (305 mm) o.c.
4. Flash roof edge scuppers with a coated metal insert that is mechanically attached to the roof edge and integrated as a part of the metal edging.
5. Alternatively, roof edges may be flashed with a 2-piece snap on fascia system, adhering the roof membrane to a metal cant and face nailing the membrane 8” (152 mm) on center prior to installing a snap-on fascia.
    a) Submit design drawings for review and approval to Architect or Specifier before fabrication.
    b) Installing contractor shall check as-built conditions and verify the manufacturer’s roof edging details for accuracy to fit the wall assembly prior to fabrication. The installer shall comply with the roof edging manufacturer’s installation guide when setting edging.

3.10 ROOF PROTECTION

A. Protect all partially and fully completed roofing work from other trades until completion.

B. Whenever possible, stage materials in such a manner that foot traffic is minimized over completed roof areas.

C. When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed roof areas from traffic and point loading during the application process.

D. Temporary tie-ins shall be installed at the end of each workday and removed prior to commencement of work the following day.

3.11 CLEAN-UP

A. All work areas are to be kept clean, clear and free of debris at all times.

B. Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.

C. All tools and unused materials must be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.

D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.

E. Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.

F. Clean and restore all damaged surfaces to their original condition.

END OF SECTION

SECTION 076200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Formed roof-drainage sheet metal fabrications.
2. Formed low-slope roof sheet metal fabrications.
3. Formed equipment support flashing.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following
1. Elastomeric sealant.
2. Butyl sealant.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.

4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples: For each exposed product and for each color and texture specified, 12 inches (300 mm) long by actual width.

D. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

E. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

D. Evaluation Reports: For copings and roof edge flashing, from an agency acceptable to authority having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.

E. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

B. Special warranty.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical roof edge eave, including fascia fascia trim, approximately 10 feet (3.0 m) long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 (Z275) coating designation; prepainted by coil-coating process to comply with ASTM A755/A755M.
1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Color: As selected by Architect from manufacturer's full range.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.
3. Fasteners for Zinc Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.

C. Solder:

1. For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

E. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.4 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams:

1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
3. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.5 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters:

1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
2. Fabricate in minimum 96-inch- (2400-mm-) long sections.
3. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness.
4. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
5. Gutter Profile: Style A in accordance with cited sheet metal standard. 6”
6. Expansion Joints: Lap type.
7. Fabricate from the following materials:
    a. Galvanized Steel: 24 gauge.

B. Downspouts: Fabricate rectangular downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.

1. Fabricated Hanger Style: Fig. 1-35A in accordance with SMACNA's "Architectural Sheet Metal Manual."
2. Fabricate from the following materials:
    a. Galvanized Steel: 26 gauge.

C. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fabricate from the following materials:
1. Galvanized Steel: 24 gauge.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, exposed cover plate.
2. Fabricate with scuppers spaced 10 feet (3 m) apart, to dimensions required with 4-inch- (100-mm-) wide flanges and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
3. Fabricate from the following materials:
    a. Galvanized Steel: 24 gauge.

B. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, fasten and seal watertight.

1. Coping Profile: Fig. 3-4A in accordance with SMACNA's "Architectural Sheet Metal Manual."
2. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, exposed cover plate.
3. Fabricate from the following materials:
    a. Galvanized Steel: 24 gauge.

C. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
1. Galvanized Steel: 24 gauge.

D. Flashing Receivers: Fabricate from the following materials:
1. Galvanized Steel: 24 gauge.

E. Roof-Penetration Flashing: Fabricate from the following materials:
1. Galvanized Steel: 24 gauge.

2.7 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
1. Galvanized Steel: 24 gauge.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12 inches (300 mm) o.c.
6. Space individual cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.

7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
8. Do not field cut sheet metal flashing and trim by torch.
9. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated.

a. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant.
b. Form joints to completely conceal sealant.
c. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way.
d. Adjust setting proportionately for installation at higher ambient temperatures.

1) Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.

1. Pretin edges of sheets with solder to width of 1-1/2 inches (38 mm); however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not solder metallic-coated steel sheet.
3. Do not pretin zinc-tin alloy-coated copper.
4. Do not use torches for soldering.
5. Heat surfaces to receive solder, and flow solder into joint.

a. Fill joint completely.
b. Completely remove flux and spatter from exposed surfaces.

3.3 INSTALLATION OF ROOF-DRAINAGE SYSTEM

A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters:

1. Join sections with joints sealed with sealant.
2. Provide for thermal expansion.
3. Attach gutters at eave or fascia to firmly anchor them in position.
4. Provide end closures and seal watertight with sealant.
5. Slope to downspouts.
6. Fasten gutter spacers to front and back of gutter.
7. Anchor and loosely lock back edge of gutter to continuous eave flashing.
8. Anchor gutter with gutter brackets spaced not more than 24 inches (600 mm) apart to roof deck unless otherwise indicated, and loosely lock to front gutter bead.
9. Install gutter with expansion joints at locations indicated on Drawings, but not exceeding, 50 feet (15.2 m) apart. Install expansion-joint caps.

C. Downspouts:

1. Join sections with 1-1/2-inch (38-mm) telescoping joints.
2. Provide hangers with fasteners designed to hold downspouts securely to walls.
3. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
4. Provide elbows at base of downspout to direct water away from building.
5. Connect downspouts to underground drainage system.

D. Parapet Scuppers:

1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
2. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.
3. Loosely lock front edge of scupper with conductor head.
4. seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.

3.4 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Copings:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.

    a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch (400-mm) centers.
    b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch (600-mm) centers.

3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.

1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
2. Extend counterflashing 4 inches (100 mm) over base flashing.
3. Lap counterflashing joints minimum of 4 inches (100 mm).
4. Secure in waterproof manner by means of anchor and washer spaced at 12 inches (300 mm) o.c. along perimeter and 6 inches (150 mm) o.c. at corners areas unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric (for exposed areas) butyl sealant (for concealed areas) and clamp flashing to pipes that penetrate roof.

3.5 INSTALLATION OF MISCELLANEOUS FLASHING

A. Equipment Support Flashing:

1. Coordinate installation of equipment support flashing with installation of roofing and equipment.
2. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

3.8 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION

SECTION 078413
PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

1.02 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between, fire rated wall and floor assemblies.

1.03 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

Only tested firestop systems shall be used in specific locations as follows:

A. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

B. Safing slot gaps between edge of floor slabs and curtain walls.

C. Openings between structurally separate sections of wall or floors.

D. Gaps between the top of walls and ceilings or roof assemblies.

E. Expansion joints in walls and floors.

F. Openings and penetrations in fire-rated partitions or walls containing fire doors.

G. Openings around structural members which penetrate floors or walls.

1.04 RELATED WORK OF OTHER SECTIONS

A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

1. Section 033000 - Cast-In-Place Concrete
2. Section 042000 – Unit Masonry
3. Section 079200 - Caulking and Joint Sealants
4. Section 092900 - Gypsum Board Assemblies
5. Division 15 - Mechanical
6. Division 16 - Electrical

1.05 REFERENCES

A. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops"

B. Test Requirements: UL 1479, “Fire Tests of Through-Penetration Firestops”

C. Test Requirements: UL 2079, “Tests for Fire Resistance of Building Joint Systems”

D. Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:
   a. Firestop Devices (XHJI)
   b. Fire Resistance Ratings (BXRH)
   c. Through-Penetration Firestop Systems (XHEZ)
   d. Fill, Voids, or Cavity Material (XHHW)
   e. Forming Materials (XHKU)
   f. Joint Systems (XHBN)
   g. Perimeter Fire Containment Systems (XHDG)

2. Alternate Systems: “Omega Point Laboratories Directory” (updated annually).

E. Test Requirements: ASTM E 1966, “Standard Test Method for Fire Resistive Joint Systems”

F. Test Requirements: ASTM E 2307, “Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus”

G. Inspection Requirements: ASTM E 2174, “Standard Practice for On-site Inspection of Installed Fire Stops”

H. ASTM E 84, “Standard Test Method for Surface Burning Characteristics of Building Materials”

I. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

J. International Building Code (IBC 2009)

K. NFPA 101 - Life Safety Code

L. NFPA 70 - National Electric Code

1.06 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide through-penetration fire stop systems and fire-resistive joint systems that comply with specified requirements of tested systems.

B. Fire stop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed fire stop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Fire stop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

1.07 SUBMITTALS

A. Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of qualified tested firestop

systems to be used and manufacturer's installation instructions to comply with Section 01300.

B. Manufacturer's engineering judgment identification number and document details when no qualified tested system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in document.

C. Submit material safety data sheets provided with product delivered to job-site.

1.08 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A supplier's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

B. Installation Responsibility: assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.

C. The work is to be installed by a contractor with at least one of the following qualifications:

FM 4991 Approved Contractor
UL Approved Contractor
Hilti Accredited Fire Stop Specialty Contractor

D. Firm with not less than 3 years experience with fire stop installation.

E. Successfully completed not less that 3 comparable scale projects using similar systems.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 - PRODUCTS

2.01 FIRESTOPPING - GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

1. F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.

D. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

1. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
2. T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

3. W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.

E. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.

F. Mold Resistance: Provide penetration firestoppping with mold and mildew resistance rating of 0 as determined by ASTM G21.

G. Firestopping Materials are either “cast-in-place” (integral with concrete placement) or “post installed.” Provide cast-in-place firestop devices prior to concrete placement.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ), joint systems (XHBN), and perimeter firestop systems (XHDG) listed in Volume 2 of the UL Fire Resistance Directory; provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma
   800-879-8000
   www.us.hilti.com

2. Substitution requests shall be considered in accordance with contract provisions.

2.03 MATERIALS

A. Use only firestop products that have been UL 1479, ASTM E 814 or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Pre-installed firestop devices for use with noncombustible and combustible pipes (closed and open systems), conduit, and/or cable bundles penetrating concrete floors and/or gypsum walls, the following products are acceptable:

1. Hilti Cast-In Place Firestop Device (CP 680-P)
   a. Add Aerator Adaptor when used in conjunction with aerator system.
2. Hilti Tub Box Kit (CP 681) for use with tub installations.
3. Hilti Cast-In Place Firestop Device (CP 680-M) for use with noncombustible penetrants.
4. Hilti Speed Sleeve (CP 653) for use with cable penetrations.
5. Hilti Firestop Drop-In Device (CFS-DID) for use with noncombustible and combustible penetrants.
6. Hilti Firestop Block (CFS-BL)

C. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE)
2. Hilti Self-leveling Firestop Sealant (CP 604)
3. Hilti Fire Foam (CP 620)
4. Hilti Flexible Firestop Sealant (CP 606)
5. Hilti Elastomeric Firestop Sealant (CP 601S)

D. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti Elastomeric Firestop Sealant (CP 601S)
2. Hilti Flexible Firestop Sealant (CP 606)
3. Hilti Intumescent Firestop Sealant (FS-ONE)

E. Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps, the following products are acceptable:

1. Hilti Firestop Joint Spray (CFS-SP WB)
2. Hilti Firestop Joint Spray (CP 672 FC (FAST CURE))
3. Hilti Elastomeric Firestop Sealant (CP 601S)
4. Hilti Flexible Firestop Sealant (CP 606)
5. Hilti Self-leveling Firestop Sealant (CP 604)

F. Pre-formed mineral wool designed to fit flutes of metal profile deck and gap between top of wall and metal profile deck; as a backer for spray material.

1. Hilti Speed Plugs (CP 777)
2. Hilti Speed Strips (CP 767)

G. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE)

H. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE)
2. Hilti Fire Foam (CP 620)
3. Hilti Elastomeric Firestop Sealant (CP 601S)
4. Hilti Flexible Firestop Sealant (CP 606)

I. Non-curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti Firestop Putty Stick (CP 618)
2. Hilti Firestop Plug (CFS-PL)

J. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:

1. Hilti Firestop Putty Pad (CP 617)
2. Hilti Firestop Box Insert

K. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti Firestop Collar (CP 643N)
2. Hilti Firestop Collar (CP 644)
3. Hilti Wrap Strips (CP 648E/648S)

L. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti Firestop Mortar (CP 637)
2. Hilti Firestop Block (CFS-BL)
3. Hilti Fire Foam (CP 620)
4. Hilti Firestop Board (CP 675T)

M. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL)
2. Hilti Firestop Board (CP 675T)

N. Re-penetrable, round cable management devices for use with new or existing cable bundles penetrating gypsum or masonry walls, the following products are acceptable:

1. Hilti Speed Sleeve (CP 653) with integrated smoke seal fabric membrane.
2. Hilti Firestop Sleeve (CFS-SL SK)
3. Hilti Retrofit Sleeve (CFS-SL RK) for use with existing cable bundles.
4. Hilti Gangplate (CFS-SL GP) for use with multiple cable management devices.
5. Hilti Gangplate Cap (CFS-SL GP CAP) for use at blank openings in gangplate for future penetrations.

O. Sealants or caulking materials used for openings between structurally separate sections of wall and floors, the following products are acceptable:

1. Hilti Firestop Joint Spray (CFS-SP WB)
2. Hilti Firestop Joint Spray (CP 672 FC (FAST CURE))
3. Hilti Elastomeric Firestop Sealant (CP 601S)
4. Hilti Flexible Firestop Sealant (CP 606)
5. Hilti Self-leveling Firestop Sealant (CP 604)

P. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:

1. Hilti CFS-BL Firestop Block
2. Hilti CFS-PL Firestop Plug

Q. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.

R. Provide a firestop system with an Assembly Rating as determined by UL 2079 which is equal to the time rating of construction joint assembly.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.
2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate construction of openings, penetrations and construction joints to ensure that the fire stop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

C. Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.

D. Do not cover up through-penetration fire stop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector.

3.03 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory or Omega Point Laboratories Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.

1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
3. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops” or other recognized standard.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

E. Manufacturer’s Field Services: During Installation, provide periodic destructive testing inspections to assure proper installation/application. After installation is complete, submit findings in writing indicating whether or not the installation of the tested system identified was installed correctly.

3.05 IDENTIFICATION & DOCUMENTATION

A. The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration and joint location on the entire project.

A.1 The Documentation Form for through penetrations is to include:

1. A Sequential Location Number
2. The Project Name
3. Date of Installation
4. Detailed description of the penetrations location
5. Tested System or Engineered Judgment Number
6. Type of assembly penetrated
7. A detailed description of the size and type of penetrating item
8. Size of opening
9. Number of sides of assemblies addressed
10. Hourly rating to be achieved
11. Installers Name

A.2 The Documentation Form for Construction Joints is to include:

1. A Sequential Location Number
2. The Project Name
3. Date of Installation
4. Detailed description of the Construction Joints location
5. Tested System or Engineered Judgment Number
6. Type of Construction Joint
7. The Width of the Joint
8. The Lineal Footage of the Joint
9. Number of sides addressed
10. Hourly rating to be achieved
11. Installers Name

B. Copies of these documents are to be provided to the general contractor at the completion of the project.

C. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning -Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's Name, address, and phone number.
3. Through-Penetration firestop system designation of applicable testing and inspecting agency.
4. Date of Installation.
5. Through-Penetration firestop system manufacturer's name.
6. Installer's Name.

3.06 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

3.07 LABOR USE TO INSTALL FIRESTOP SYSTEMS

A. To ensure complete harmony on the project site, the installation of each scope of work is to be performed jurisdictionally correct per existing trade agreements.

END OF SECTION

SECTION 079200
CAULKING AND SEALANTS

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Section Includes:
1. Joint sealants designed for interior and exterior above grade applications.

B. Related Sections:
1. Section 033000 - Cast-In-Place Concrete.
2. Section 078413 - Firestopping.
3. Section 084113 - Aluminum-Framed Entrances and Storefronts.
4. Section 088000 - Glass and Glazing.
5. Section 092900 - Gypsum Board Assemblies.

1.2 SYSTEM DESCRIPTION

A. Design Requirements:
1. Design number of joints and joint widths for maximum of plus or minus 25 percent movement.
2. Design depth of sealant to be 1/2 width of joint.
   a. Maximum Depth: 1/2 inch (13 mm).
   b. Minimum Depth: 1/4 inch (6 mm).
   c. Maximum Recommended Width: 1-1/2 inches (38 mm)

B. Performance Requirements: ASTM C 920, Type S, Grade NS, Class 25, Use T, NT, M, A, G and O.

1.3 SUBMITTALS

A. Comply with Section 01300.

B. Product Data: Submit manufacturer's technical bulletins and MSDS on each product.

C. Samples:
1. Initial Selection Purposes: For each product exposed to view, manufacturer's standard bead consisting of strips of actual products showing full range of colors available.
2. Verification: 2 sets of each type and color of joint sealant required. Install joint sealant Samples in 1/2 inch wide joints formed between two 6 inch long strips of material matching appearance of exposed surfaces adjacent to joint sealants.

D. Submit laboratory tests or data validating product compliance with performance criteria specified.

E. Submit list of references from 5 projects similar in scope to this Project. Include contact name and phone number of person charged with oversight of each project.

1.4 QUALITY ASSURANCE

A. Comply with Section 01400.

B. Qualifications:
1. Manufacturer Qualifications: Company regularly engaged in manufacturing and marketing of products specified in this Section.
2. Manufacturer Qualifications: Company shall be ISO 9001:2000 Certified.

C. Installer Qualifications: Qualified to perform Work specified by reason of experience or training provided by product manufacturer.

D. Mock-Ups:

1. At start of Project, perform mock-up of required sealant Work at 1 area of building. Perform minimum of 1 mock-up for each different combination of substrates to be sealed. Coordinate mock-up areas with Architect.
2. Install mock-ups and test in presence of sealant manufacturer's authorized representative and Architect to assure installation procedures are consistent with warranty requirements.
3. After sealant has achieved sufficient cure as coordinated with manufacturer's representative, conduct adhesion pull-tests, or non-destructive testing, at discretion of Architect. Conduct tests per ASTM C1521.
    a. Confirm results of adhesion tests as acceptable by Architect, Owner or Owner's representative, and sealant manufacturer prior to proceeding with Work.
4. Leave approved mock-ups in place to establish standards and guidelines for acceptable installation of sealant Work and acceptable appearance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01600.

B. Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number. Provide Material Safety Data Sheets for each product.

C. Store products in a location protected from freezing, damage, construction activity, precipitation, and direct sunlight per manufacturer's recommendations.

D. Condition products to approximately 60 degrees F (16 degrees C) to 70 degrees F (21 degrees C) for use per manufacturer's recommendations.

E. Handle products with appropriate precautions and care as stated on Material Safety Data Sheet.

1.6 PROJECT CONDITIONS

A. Do not use products under conditions of precipitation, or in inclement or freezing weather. Verify that substrates are clean, dry, and frost-free. Use appropriate measures for protection and supplementary heating to ensure proper curing conditions per manufacturer's recommendations if application during inclement weather occurs.

1.7 WARRANTY

A. Provide manufacturer's 5 year standard material warranty.

B. Include coverage for replacement of sealant materials which fail to achieve water tight seal, exhibit loss of adhesion or cohesion, or do not cure, provided sealant has been installed per manufacturer's recommendations.

C. Warranty Exclusions: Failure resulting from excessive movement, concrete shrinkage, structural cracks or defects, faulty construction, faulty design, faulty materials (other than joint sealants), improper installation, misuse of structure, settlement, or accident, fire, or other casualty or physical damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products from the following manufacturer:
1. BASF Building Systems
   889 Valley Park Drive
   Shakopee, MN 55379
   Customer Service: 800- 433-9517
   Technical Service: 800-243-6739

Direct Phone: 952-496-6000
Internet: www.BASFbuildingsystems.com

B. Substitutions: Comply with Section 01600.

C. Specifications and Drawings are based on manufacturer's proprietary literature from BASF Building Systems. Other manufacturers shall comply with minimum levels of material, color selection, and detailing indicated in Specifications or on Drawings. Architect will be sole judge of appropriateness of substitutions.

2.2 MATERIALS

A. Polyurethane Sealant: Single-component, non-sag, high performance, non-priming, gun-grade elastomeric polyurethane sealant, ASTM C920, Type S, Grade NS, Class 25, Use T, NT, M, A, G, and O. Canadian Specification CAN/CGSB-19.13-M87, Classification MCG-2-25-A-N, No. 81026; UL classified (fire resistance):
1. Acceptable Product: Sonolastic® NP 1 by BASF Building Systems.

2.3 COLOR

A. Sealant Colors: Selected by Architect from manufacturer's full color range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect areas involved in Work to establish extent of Work, access, and need for protection of surrounding construction.

B. Examine joints for defects that would adversely affect quality of installation.

C. Provide additional joint preparation, beyond that outlined in Specifications, as required by sealant manufacturer and Architect’s recommendations based on mock-ups and field adhesion tests.

3.2 PREPARATION

A. Remove loose materials and foreign matter that impair adhesion of joint sealant.

B. Clean joints as required to expose sound surface free of contamination and laitance.

C. Ensure structurally sound surfaces, dry, clean, free of dirt, moisture, loose particles, oil, grease, asphalt, tar, paint, wax, rust, waterproofing, curing and parting compounds, membrane materials, and other foreign matter.

D. Concrete, Stone, and Other Masonry:
1. Clean by grinding, sandblasting, or wire brushing to expose sound surface free of contamination and laitance.

E. Wood:
1. Clean new and weathered wood. Scrape away loose paint to bare wood. If coatings cannot be removed, test coatings to verify adhesion of sealant or determine appropriate.

F. Metal:
1. Remove scale, rust, and coatings from metal to expose bright white surface. Remove protective coatings as well as chemical residue or film.
2. Aluminum Frames: Remove clear lacquer before application of joint sealants. If coatings cannot be removed, test coatings to verify adhesion of sealant or determine an appropriate primer.
3. Prime the following surfaces with primer recommended by joint sealant manufacturer:
a. Copper.

b. Stainless steel.
c. Galvanized steel.
d. Fluorocarbon (Kynar) coatings.

4. Remove other protective coatings or finishes that could interfere with adhesion.

3.3 PRIMING

A. Where circumstances or substrates require primer, comply with the following requirements:
1. Apply primer full strength with brush or clean, lint-free cloth. Apply primer to a light, uniform coating. Porous surfaces require more primer. Do not over apply. Do not apply primer onto face of substrate.
2. Allow primer to dry before applying joint sealants. Depending on temperature and humidity, primer will be tack free in 15 to 120 minutes.
3. Prime and seal on same workday.

3.4 INSTALLATION

A. Back-Up Material:
1. Install appropriate size backer rod, larger than joint where necessary per manufacturer's recommendations, and in manner to provide concave sealant profile.
2. Where joint depth does not permit installation of backer rod, install adhesive-backed polyethylene bond-breaker tape along entire back of joint to prevent 3-sided adhesion of joint sealant.

B. Sealant:
1. Verify that temperature and moisture conditions are within manufacturer’s acceptable limits.
2. Using fresh sealant and equipment that is in proper working order, completely fill joint with sealant, filling from bottom up to avoid entrapping air.
3. Using clean, dry tool with rounded edge, and of appropriate width for each joint, tool freshly installed sealant to provide preferred concave profile, to ensure intimate contact between sealant and substrate, and to provide neat appearance. Where surface aggregate does not permit proper tooling, install sealant and backer rod so that face of joint is recessed behind exposed aggregate, and sealant is bonded to firm, even surface.
4. Use dry tooling method. Do not use tooling agents such as soapy water or solvents that have not been approved by sealant manufacturer.

3.5 CURING TIME

A. Curing of joint sealants varies with temperature and humidity. The following times assume 75 degrees F (24 degrees C), 50 percent relative humidity, and joints 1/2 inch (13 mm) wide by 1/4 inch (6 mm).
1. Skins: Overnight or within 24 hours.
2. Functional: Within 3 days.
3. Full Cure: Approximately 1 week.

3.6 INSPECTION

A. During execution of Work, inspect Work to assure compliance with manufacturer’s guidelines, these Specifications when they exceed manufacturer’s guidelines, and good construction practice.
1. Refer to latest revision of ASTM C1521 for test methods and frequency.
2. Allow inspections of Work and assist in testing requested by manufacturer’s representative and Architect.

B. Non-Compliant Work: If inspections reveal non-compliant Work or Work that was not installed per Specifications, and/or manufacturer requirements, remove adjacent Work until a location is reached where installation was performed properly. Assist in spot-checking of remainder of Work.

3.7 CLEANING

A. Remove uncured sealant and joint filler with xylene, toluene, MEK, or other sealant manufacturer approved cleaning agent.

B. Remove cured sealant by cutting with sharp-edged tool.

C. Remove thin films by abrading.

D. Remove debris related to application of sealants from Project site per applicable regulations for hazardous waste disposal.

3.8 PROTECTION

A. Protect Work from contaminating substances and damage resulting from other construction operations or other causes so that sealed joints are without deterioration or damage at time of Project completion.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

SUMMARY

This Section includes the following products manufactured in accordance with SDI Recommended Standards:

Doors: Seamless, hollow or composite construction standard steel doors for interior and exterior locations.

Frames: Pressed steel frames for doors, transoms, sidelights, mullions, interior glazed panels, insulated panels, and other interior and exterior openings of following type:

Welded unit type.

Assemblies: Provide standard steel door and frame assemblies as required for the following:

Thermal rated (insulated)
Labeled and fire rated.

Provide factory primed doors and frames to be field painted.

Painting primed doors and frames is specified in Division 9 Section "Painting."

Wood doors are specified in another Division 8 Section.

Door hardware is specified in another Division 8 Section.

Building in of anchors and grouting of frames in masonry construction is specified in Division 4.

QUALITY ASSURANCE:

Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.

Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies whose fire resistance characteristics have been determined per ASTM E 152 and which are labeled and listed by UL, Factory Mutual, Warnock Hersey, or other testing and inspecting organization acceptable to authorities having jurisdiction.

Temperature Rise Rating: At stairwell enclosures, provide doors which have Temperature Rise Rating of 450^{o} F (232^{o} C) maximum in 30 minutes of fire exposure.

SUBMITTALS:

Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements. For each type of door and frame specified, submit details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

Shop Drawings: Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections.

Show anchorage and accessory items.

Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

Indicate coordination of glazing frames and stops with glass and glazing requirements.

Label Construction Certification: For door assemblies required to be fire-rated and exceeding sizes of tested assemblies, submit manufacturer's certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

DELIVERY, STORAGE AND HANDLING:

Deliver hollow metal work cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory-primed doors.

Inspect metal work upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

Store doors and frames at building site under cover. Place units on minimum 4" high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide steel doors and frames by one of the following:

Steel Doors and Frames, (General):
- Allied Steel Products, Inc.
- Amweld/Div. American Welding & Mfg. Co.
- Ceco Door
- D&D Specialties, Inc. - Union, South Carolina
- Steelcraft/Div. American Standard Co.
- Republic Builders Products Corp./Subs. Republic Steel.

MATERIALS:

Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.

Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.

Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, with ASTM A 525, G60 zinc coating, mill phosphatized.

Supports and Anchors: Fabricate of not less than 18-gage galvanized sheet steel.

Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.

Shop Applied Paint: After fabrication apply rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints.

FABRICATION, GENERAL:

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. Comply with SDI-100 requirements as follows:

Internal Construction: Manufacturer's standard honeycomb, polyurethane, polystyrene, unitized steel grid, vertical steel stiffeners, or rigid mineral fiber core with internal sound deadener on inside of face sheets where appropriate in accordance with SDI standards.

Clearances: Not more than 1/8 inch at jambs and heads except between non-fire-rated pairs of doors not more than 1/4 inch. Not more than 3/4 inch at bottom.

Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel.

Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).

Fabricate exterior doors, panels, and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gage inverted steel channels.

Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236 or ASTM C 976 on fully operable door assemblies.

Unless otherwise indicated, provide thermal-rated assemblies with U factor of 0.41 Btu or better.

Finish Hardware Preparation: 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.

For concealed overhead door closers, provide space, cutouts, reinforcing and provisions for fastening in top rail of doors or head of frames, as applicable.

Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.

Locate finish hardware as shown on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware," published by Door and Hardware Institute.

Shop Painting: Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.

Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.

Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

Glazing Stops: Minimum 20 gage steel or .040-inch-thick aluminum.

Provide non-removable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.

Provide screw applied removable glazing beads on inside of glass, louvers, and other panels in doors.

STANDARD STEEL DOORS:

Provide metal doors of SDI grades and models specified below or as indicated on drawings or schedules:

Interior Doors: SDI-100, Grade II, heavy-duty, Model 3, minimum 18- gage faces.
Exterior Doors: SDI-100, Grade III, extra heavy-duty, Model 3, min. **16-gage galvanized face**.

Door Louvers: Provide sightproof stationary louvers for interior doors where indicated, constructed of inverted V-shaped or Y-shaped blades formed of 24-gage cold-rolled steel set into minimum 20-gage steel frame.

STANDARD STEEL FRAMES:

Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 16-gage cold-rolled furniture steel, except frames over 3'-4" in width shall be 14 -gage.

Fabricate frames with mitered and welded corners.
Form exterior frames of hot-dip galvanized steel, 16-gage minimum.

Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single door frames and 2 silencers on heads of double door frames.

Plaster Guards: Provide 26-gage steel plaster guards or mortar boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

PART 3 - EXECUTION

INSTALLATION:

General: Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions For Steel Frames", unless otherwise indicated.

Except for frames located at existing concrete or masonry and at drywall installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels..

Install fire-rated frames in accordance with NFPA Standard No. 80.

In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In closed steel stud partitions, attach wall anchors to studs with screws.

Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
Place fire-rated doors with clearances as specified in NFPA Standard No. 80.

ADJUST AND CLEAN:

Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.

Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION

SECTION 081400
PLASTIC-LAMINATE-FACED WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wood doors of the following types:
   1. High pressure decorative laminate (HPDL) faced doors. (Architectural Series)

1.2 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

B. Section 06 20 00 - Finish Carpentry.

C. Section 08 11 00 - Metal Doors and Frames.

D. Section 08 71 00 - FInish Hardware.

E. Section 08 88 00 - Glass and Glazing.

F. Section 09 90 00 - Painting and Coating.

1.3 REFERENCES

A. ASTM International (ASTM):
   1. ASTM D 1037 - Methods for Evaluating the Properties of Wood-Based Fiber and Particle Board
   2. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
   3. ASTM E 152 - Methods of Fire Tests of Door Assemblies.

B. American National Standards Institute (ANSI):
   1. ANSI A 208.1 - Standard for Particleboard.
   2. ANSI A 208.2 - Standard for Medium Density Fiberboard for Interior Use.

C. Window and Door Manufacturers Association (WDMA):
   1. WDMA I.S. 1A-13 - Industry Standard for Interior Architectural Wood Flush Doors.
   2. WDMA I.S. 6A-13 - Industry Standard for Interior Architectural Stile and Rail Doors.

D. Architectural Woodwork Standards (AWS):
   1. Architectural Woodwork Institute (AWI): Quality Standards Illustrated (QSI).
   2. Woodwork Institute (WI): Manual of Millwork (MM).

E. National Fire Protection Association (NFPA):
   1. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
   2. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

F. Underwriters' Laboratories (UL):
   1. UL 10B - Fire Tests of Door Assemblies.
   2. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
   3. UL 752 - Bullet-Resisting Equipment.

G. ITS (Warnock Hersey): Certification Listings for Fire Doors.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's product construction data, hardware attachment performance data, specifications and installation instructions for each type of wood door, including details

of core, raised panel (if applicable) and edge construction, trim for lite openings and similar components:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Cleaning methods.

C. Product Certification: Provide documents showing compliance to the following WDMA door attributes, validating the specified WDMA Performance Duty Level:
1. Adhesive Bonding Durability: WDMA TM-6.
2. Cycle Slam: WDMA TM-7.
3. Hinge Loading: WDMA TM-8.
4. Screw Holding: WDMA TM-10.
   a. Door Face.
   b. Vertical Door Edge.
   c. Horizontal Door Edge (applies when hardware is attached).

E. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details and the following:
1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

F. Verification Samples:
1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish.
2. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in finished work.
3. Provide construction samples of doors, approximately 5 by 5 inches (125 by 125 mm), with door faces and vertical edges representing actual construction to be used.
   a. Provide unfinished samples for each species of veneer and required if factory furnishing is not required, approximately 8 by 10 inches (200 by 250 mm).
4. Louver blade and frame sections, minimum 6 inches (150 mm) long, for each material and finish specified.
5. Frames for light openings, minimum 6 inches (150 mm) long, for each material, type, and finish required.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Company specializing in manufacturing products specified herein with a minimum of five years documented experience.
1. A qualified manufacturer that is a member in good standing of the Window and Door Manufacturers Association.

B. Single Source Requirements: Doors shall be supplied from a single manufacturing organization.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations of industry standards.

B. Store materials in manufacturer's original sealed, labeled packaging until ready for installation and in accordance with manufacturer's instructions. Protect from damage.

C. Store and protect doors in accordance with manufacturer's recommendations including but not limited to the following.
1. Compliance: WDMA Standards.
2. Store doors flat and off the floor on a level surface in a dry, well-ventilated building. Do

not store on edge. Protect/cover doors from dirt, water and abuse.

3. Certain wood species are light sensitive. Protect doors from exposure to light (artificial or natural) after delivery.
4. When handling doors, always lift and carry. Do not drag across other doors or surfaces. Handle with clean hands or gloves.
5. Each door will be marked on top rail with opening number.

1.7 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 recommended limits.

1. Environmental Limits: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 degrees F (16 and 32 degrees C) and relative humidity between 25 and 55 percent during remainder of construction period.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
   b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.

B. Architectural Series Solid Core Doors:

1. Door Warranty - Life of the Original Installation.
2. Re-Finishing and Re-Hanging Allowances - Life of the Original Installation - Mohawk will negotiate reasonable allowances provided the doors have been inspected and approved by an authorized representative of Mohawk. Mohawk is not obligated to honor any aspect of this warranty, if the reason for which the door is being rejected was apparent prior to hanging. Mohawk, at the company's discretion, will satisfy any legitimate claim, by repairing the door when possible, replacing the door as originally ordered, or by refunding the original sale price of the door.

C. Commercial Series Solid Core Doors:

1. Door Warranty - Life of the Original Installation - (Excludes All Hollow Core Doors, and All Bifold Doors).
2. Re-Finishing and Re-Hanging Allowances - Within 12 Months of Mohawk Invoice Date Only - Mohawk will negotiate reasonable allowances provided the doors have been inspected and approved by an authorized representative of Mohawk. Mohawk is not obligated to honor any aspect of this warranty, if the reason for which the door is being rejected was apparent prior to hanging. Mohawk, at the company's discretion, will satisfy any legitimate claim, by repairing the door when possible, replacing the door as originally ordered, or by refunding the original sale price of the door.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of design Manufacturer: Mohawk, 980 Point Township Rd. Point Township P. O. Box 112; Northumberland, PA 17857; Tel: 570-473-3557; Fax: 570-473-3737; Email: request info (bshovlin@masonite.com); Web:www.mohawkdoors.com

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 DOORS - GENERAL

C. Structural-Composite-Lumber-Core Doors:

1. Provide Structural Composite Lumber core as required to meet WDMA Performance Duty Level required.
2. Provide Structural Composite Lumber core for doors with glass openings as required to meet stile dimensions shown on door schedule and elevations.
3. Provide Structural Composite Lumber core for all doors with the exception of 45 to 90 minute fire rated and sound rated doors.
4. Top and Bottom Rails: Mill Option including; Softwood, Hardwood, or SCL. MDF rails are not acceptable. Rails are not required per WDMA standards.
5. Structural Composite Lumber: WDMA T.M.10.
    a. Screw Withdrawal, Face: Per standard.
    b. Screw Withdrawal, Edge: Per standard.

I. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C required by Authority Having Jurisdiction (AHJ).
1. Label Certification: Doors requiring fire-rating will carry either UL or ITS (Warnock Hersey) label. Manufacturer's certification labels may be used for door size variations if approved by AHJ (Authority Having Jurisdiction).
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 250 degrees F (121 degrees C) above ambient after 30 minutes of standard fire-test exposure.
3. 20 Minute Rated Door Lite Openings: Maximum 1296 sq/in (8361 sq/cm) 36 inches W and 54 inches - H (914 mm and 1372 mm) with approved intumescent lined cut- out.
4. Cores: 45 Minute Particleboard-Core. Extra Heavy Duty 1-3/4 inches (44 mm) door only.
5. Cores: 45, 60, 90 Minute Mineral Core. Non-Asbestos material.
7. Blocking: Provide composite blocking approved for use in doors of fire-protection ratings indicated as needed to maintain WDMA performance level and eliminate through-bolting hardware.
8. Edge Construction: Category A - intumescent included in door construction where required.
9. Edge Construction: Category B - intumescent applied to frames by door installer where required.
10. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals.
11. Pairs: Provide formed-steel edges and astragals with intumescent seals as required.
    a. Provide steel edges and astragals primed for field painting.
    b. Provide veneer wrapped steel edges and astragals. Veneer shall be same specie as face.
    c. Finish steel edges and astragals with baked enamel, color as selected from manufacturer's standard offering.
    d. Provide stainless steel edges and astragals.

J. Smoke and Draft Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

2.4 HIGH PRESSURE DECORATIVE LAMINATE (HPDL) FACED DOORS

A. HPDL Doors:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Mohawk "Architectural Series" or a comparable product by one of the following:
    a. Algoma.
    b. Marshfield.
    c. Baillargeon.
2. HPDL Face: High-Pressure Decorative Laminates complying with NEMA LD 3, Grade HGS. Vertical and post formable grade laminates are not acceptable.
    a. Colors, Patterns and Finishes: Basis of design is Formica Smoky Brown Pear Naturelle Finish 5488-NT. Architect will consider other brands only if a match to basis of design.

2.9 LIGHT FRAMES AND LOUVERS

A. Factory Glazing:
1. Factory install glass as required.
2. Factory install glass in fire rated doors only.
3. Fill glazing bead nail holes in factory finished doors.
4. Wood Beads for Light Openings in Wood Doors:
a. Wood Species: Provide manufacturer's standard flush wood beads unless otherwise indicated.
e. Profile: Flush rectangular beads for 1/8 inch (3 mm) and 1/4 inch (6 mm) glazing, profile per Mohawk standard.
g. Profile: Wood lite insert for 1/8 inch (3 mm), 1/4 inch (6 mm) and 1/2 inch (13 mm) glazing, profile per Mohawk standard.
h. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips as required and approved for such use.
5. Light Openings in 20 Minute Fire-Rated Doors: Manufacturer's standard solid wood-beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.
b. Profile: Flush per Mohawk standard.
6. Light Openings in Fire-Rated Doors: Manufacturer's standard low profile narrow metal frame formed of 18 ga. cold rolled steel, cold-rolled steel sheet approved for use in doors of fire-protection rating indicated. Model 110 as manufactured by All Metal Stamping, Inc.
a. Factory primed for paint.

B. Wood Louvers:
1. Hardwood louver with approximately 25% free air (of opening size). 1 inch (25 mm) lipped frame profile assembled with Phillips #6-1-1/2 inch brass-plated, self-tapping screws. All sizes available.
2. Door manufacturer's standard solid-wood louvers unless otherwise indicated.
3. Wood Species: Same species as door faces.
4. Wood Species: Species compatible with door faces.
5. Wood Species: Any closed-grain hardwood.
6. Blade Type: Chevron.
7. Blade Type: Flat slat.

C. Metal Louvers for Fire-Rated Doors:
1. Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire-protection rating of 1-1/2 hours and less.
2. Metal: 18 gauge cold rolled steel.
3. Finish: Factory primed for paint finish applied in field.
4. Finish: Factory painted with manufacturer's standard color baked-enamel- or powder-coated finish.
5. Finish: Factory painted with custom color baked enamel or powder coated finish.

2.13 FABRICATION

A. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine doors for surface hardware.

B. Factory pre-drill all pilot holes for installation of template hinges.

C. Factory pre-fit doors for frame opening dimensions identified on shop drawings.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Examine and prepare openings and substrates using the methods recommended by manufacturer for achieving best result for the substrates under project conditions.
1. Confirm that frames comply with type, size, location and swing requirements and that they are installed plumb and square.
2. Inspect doors for any damage, manufacturing defects or pre-finish inconsistency prior

to installation, including but not limited to wrong color or poor finish.

B. Do not proceed with installation until openings and substrates have been prepared using the methods recommended by manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

3.2 INSTALLATION

A. Hardware: For installation, refer to Section 08 71 00 - FInish Hardware "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
   1. Install fire-rated doors according to NFPA 80.
   2. Install smoke- and draft-control doors according to NFPA 105.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
   1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
      a. Comply with NFPA 80 for fire-rated doors.
   2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
   3. Trim bottom rail only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Do not trim HPDL or factory finished doors for width.

3.3 ADJUSTING

A. Operation: Correct any deficiency that prohibits the door from swinging or operating freely. Do not remove hinge screws after initial insertion. Shims used for alignment purposes shall be inserted between hinge and frame. Do not insert shims between hinge and door.

B. To prevent stile failure, ensure that door closers are properly adjusted and do not limit the door opening swing. Limit door opening swing only with a properly located stop.

C. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 083113
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION:

Section specifies access doors or panels.

1.2 RELATED WORK:

A. Access doors in acoustical ceilings: Section 095113, Acoustical Panel Ceilings.

1.3 SUBMITTALS:

A. Submit in accordance with Section 01300

B. Shop Drawings: Access doors, each type, showing construction, location and installation details.

C. Manufacturer's Literature and Data: Access doors, each type.

1.4 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

A167-99(R-2009) ..... Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

A1008-10 ..... Steel Sheet, Cold-Rolled, Carbon, Structural, High Strength Low-Alloy

C. American Welding Society (AWS):

D1.3-08 ..... Structural Welding Code Sheet Steel

D. National Fire Protection Association (NFPA):

80-10..... Fire Doors and Windows

E. The National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series..... Metal Finishes Manual

F. Underwriters Laboratories, Inc. (UL):

Fire Resistance Directory

PART 2 - PRODUCTS

2.1 FABRICATION, GENERAL

A. Fabricate components to be straight, square, flat and in same plane where required.

1. Slightly round exposed edges and without burrs, snags and sharp edges.
2. Exposed welds continuous and ground smooth.
3. Weld in accordance with AWS D1.3.

B. Number of locks and non-continuous hinges as required maintaining alignment of panel with frame. For fire rated doors, use hinges and locks as required by fire test.

C. Provide anchors or make provisions in frame for anchoring to adjacent construction. Provide size, number and location of anchors on four sides to secure access door in opening. // Provide anchors as required by fire test. //

2.2 ACCESS DOORS, FIRE RATED:

A. Shall meet requirements for "B" label 1-1/2 hours with maximum temperature rise of 120 degree C (250 degrees F).

B. Comply with NFPA 80 and have Underwriters Laboratories Inc., or other nationally recognized laboratory label for Class B opening.

C. Door Panel: Form of 0.9 mm (0.0359 inch) thick // steel // stainless steel // sheet, insulated sandwich type construction.

D. Frame: Form of 1.5 mm (0.0598 inch) thick steel sheet of depth and configuration to suit material and type of construction where installed. Provide frame flange at perimeter where installed in concrete masonry or gypsum board openings.

1. Weld exposed joints in flange and grind smooth.
2. Provide frame flange at perimeter where installed in concrete masonry or gypsum board.
3. Provide expanded galvanized metal lath perimeter wings when installed in plaster except veneer plaster.

E. Automatic Closing Device: Provide automatic closing device for door.

F. Hinge: Continuous steel hinge with stainless steel pin.

G. Lock:

1. Self-latching, with provision for fitting flush a standard screw-in type lock cylinder. Lock cylinder specified in Section 08 71 00, DOOR HARDWARE.
2. Provide latch release device operable from inside of door. Mortise case in door.

2.3 ACCESS DOORS, FLUSH PANEL:

A. Door Panel:

1. Form of 1.9 mm (0.0747 inch) thick steel sheet.
2. Reinforce to maintain flat surface.

B. Frame:

1. Form of 1.5 mm (0.0598 inch) thick steel sheet of depth and configuration to suit material and type of construction where installed.
2. Provide surface mounted units having frame flange at perimeter where installed in concrete, masonry, or gypsum board construction.
3. Weld exposed joints in flange and grind smooth.
4. Provide expanded galvanized metal lath perimeter wings when installed in plaster except veneer plaster.

C. Hinge:

1. Concealed spring hinge to allow panel to open 175 degrees.
2. Provide removable hinge pin to allow removal of panel from frame.

D. Lock:

1. Flush, screwdriver operated cam lock.

2.4 ACCESS DOOR, RECESSED PANEL:

A. Door Panel:

1. Form of 1.2 mm (0.0478 inch) thick steel sheet to form a 25 mm (one inch) deep recessed pan to accommodate the installation of acoustical units, acoustical plaster, or other materials where shown in walls and ceiling.
2. Reinforce as required to prevent sagging.

B. Frame:
1. Form of 1.5 mm (0.0598 inch) thick steel sheet of depth and configuration to suit installation in suspension system of ceiling or wall framing.
2. Extend sides of frame to protect edge of acoustical units when panel is in open position.
3. Provide shims, bushings, clips and other devices necessary for installation.

C. Hinge: Continuous steel hinge with stainless steel pin or concealed hinge.

D. Lock:
1. Flush screwdriver operated cam lock.
2. Provide sleeve of plastic or stainless steel grommet to protect hole made in acoustical unit for screwdriver access to lock.

2.5 FINISH:

A. Provide in accordance with NAAMM AMP 500 series on exposed surfaces.

B. Steel Surfaces: Baked-on prime coat over a protective phosphate coating.

C. Stainless Steel: No. 4 for exposed surfaces.

2.6 SIZE:

Minimum 600 mm (24 inches) square door unless otherwise shown or required to suit opening in suspension system of ceiling.

PART 3 - EXECUTION

3.1 LOCATION:

A. Provide access panels or doors wherever any valves, traps, dampers, cleanouts, and other control items of mechanical, electrical and conveyor work are concealed in wall or partition, or are above ceiling of gypsum board or plaster.

B. Use fire rated doors in fire rated partitions and ceilings.

C. Use flush panels in partitions and gypsum board or plaster ceilings, except lay-in acoustical panel ceilings or upward access acoustical tile ceilings.

3.2 INSTALLATION, GENERAL:

A. Install access doors in openings to have sides vertical in wall installations, and parallel to ceiling suspension grid or side walls when installed in ceiling.

B. Set frames so that edge of frames without flanges will finish flush with surrounding finish surfaces.

C. Set frames with flanges to overlap opening and so that face will be uniformly spaced from the finish surface.

D. Set recessed panel access doors recessed so that face of surrounding materials will finish on the same plane, when finish in door is installed.

3.3 ANCHORAGE:

A. Secure frames to adjacent construction using anchors attached to frames or by use of bolts or screws through the frame members.

B. Type, size and number of anchoring device suitable for the material surrounding the opening, maintain alignment, and resist displacement during normal use of access door.

C. Anchors for fire rated access doors shall meet requirements of applicable fire test.

3.4 ADJUSTMENT:

A. Adjust hardware so that door panel will open freely.

B. Adjust door when closed so door panel is centered in the frame.

END OF SECTION

SECTION 083300
OVERHEAD COILING COUNTER DOOR

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Section Includes: Manual operated, overhead rolling counter doors. Provide complete operating door assemblies as scheduled on the drawings, including door curtains, guides, bottom bars, counterbalance mechanism, hardware, operators and installation accessories.

RELATED WORK:

Field painting is specified in Division-9.

Masonry work is specified inDivision-4.

Gypsum board work is specified in Division-9.

Electrical wiring and conduit, fuses, disconnect switches, connection of operator to power supply, installation of control station and wiring, and connection to alarm systems are specified in Division-16. Products that may be supplied, but are not installed under this section include controls stations and smoke/heat detectors.

QUALITY ASSURANCE:

Manufacturer: Furnish overhead coiling door units by one manufacturer for entire project. Rolling doors shall be manufactured by a firm with a minimum of five years experience in the fabrication and installation of rolling fire doors.

Installer: Installation of rolling doors shall be performed by an authorized representative of the manufacturer.

Cycles: All rolling service doors shall be designed to a standard maximum of 25 cycles per day and an overall maximum of 50,000 operating cycles for the life of the door. All rolling counter doors shall be designed to a standard maximum of 10 cycles per day and an overall maximum of 20,000 operating cycles for the life of the door.

SUBMITTALS:

Product Data: Submit manufacturer's product data, roughing-in diagrams, and installation instructions for each type and size of overhead coiling door. Provide operating instructions and maintenance information, and complete information describing fire release system including electrical rough-in instructions.

Shop Drawings: Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials. Include special conditions not detailed in Product Data. Show interface with adjacent work.

Closeout Documents: Submit operation and maintenance manual along with a Certificate stating that the installed materials comply with this specification.

WARRANTY:

Warranty: Submit manufacturer’s standard warranty against defects in material and workmanship for two years from date of installation.

PART 2 - PRODUCTS

MANUFACTURERS: Subject to compliance with requirements, manufacturers offering products, which may be incorporated in the work include the following:

The Cookson Co.
Cornell Iron Works
Overhead Door Corp.
Wayne Dalton

Manufacturer's product designations: The Cookson Door Company product designations are indicated herein for purposes of establishing minimum requirements. Provide either the product designated or the comparable product of one of the other manufacturers, which comply with requirements, including those specified elsewhere in this section.

Non-Rated Counter Doors:	Model CD10-1SS, Cookson Co.
	Model ESC-10, Cornell Iron Works
	Series 651, Overhead Door
	Model 520, Wayne Dalton

ROLLING COUNTER DOOR MATERIALS AND CONSTRUCTION:

Material: The door curtain shall be constructed of interconnected strip stainless steel slats. The curtain shall be constructed of 22 gauge No. 10 (1-1/4" high by 3/8" deep) slats as designated by rolling door manufacturer. The finish on the door curtain shall be #4.

The bottom bar shall be constructed of tubular stainless steel, measuring 2" high by 1-1/4" deep, with a foam astragal on the bottom edge. The bottom bar shall receive a #4 finish.

The guides shall be constructed of a stainless steel angle and channel, 1-7/8" square. The guides shall receive a #4 finish.

The brackets shall be constructed of 3/16" thick die cast aluminum and shall have stainless steel end covers.

The barrel shall be steel tubing of not less than 4" in diameter. Oil tempered torsion springs shall be capable of correctly counter balancing the weight of the curtain. The barrel shall be designed to limit the maximum deflection to .03" per foot of opening width. The finish on the barrel shall be one (1) coat of bronze rust-inhibiting prime paint.

The hood shall be fabricated from 24 gauge stainless steel and shall be formed to fit the square brackets. The finish on the hood shall be #4.

Operation: Push-up operated doors shall open and close with a maximum of 30 pounds of effort utilizing finger lifts in the bottom bar. This type of operation should not be used for doors over 10 feet wide.

Locking Mechanisms: The push-up doors shall be secured by means of a concealed sliding bolt deadlock in the bottom bar .

PART 3 - EXECUTION

INSTALLATION: Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports in accordance with final shop drawings, manufacturer's instructions, and as specified herein.

Upon completion of installation including work by other trades, lubricate, test and adjust doors to operate easily, free from warp, twist or distortion.

FIELD QUALITY CONTROL:

Site Test: Test doors for normal operation and automatic closing. Coordinate with authorities having jurisdiction to witness test and sign Drop Test Form.

Demonstration & Instruction: Demonstrate proper operation, testing and reset procedures to Owner's Representative. Instruct Owner's Representative in maintenance procedures.

END OF SECTION

SECTION 084113
ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

SUMMARY:

Extent of aluminum entrances and storefronts is indicated on drawings and schedules. Section Includes: Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

Aluminum entrances and storefront types required for the project include:

Exterior thermal storefront door & window framing system.
Exterior thermal curtain wall door & window framing system.
Interior storefront door & window framing system.
Exterior entrance doors.
Interior doors.

Related Sections: The following sections contain requirements that relate to this Section:

Glazing: Refer to "Glass and Glazing" section of Division 8 for glazing requirements for aluminum entrances and storefronts, including doors specified to be factory-preglazed.

Lock cylinders are specified in Division 8 Hardware section.

SYSTEM DESCRIPTION:

Performance Requirements: Provide aluminum entrance and storefront assemblies that comply with specified performance characteristics. Each system shall be tested by a recognized testing laboratory or agency in accordance with specified test methods. Provide certified test results.

Thermal Movement: Design the aluminum entrance and storefront framing systems to provide for expansion and contraction of the component materials. Entrance doors shall function normally over the specified temperature range.

The system shall be capable of withstanding a metal surface temperature range of 180 deg F (100 deg C) without buckling, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, stress on glass, or other detrimental effects.

Design Requirements: Provide aluminum entrance and storefront systems that comply with structural performance, air infiltration, and water penetration requirements indicated.

Wind Loading: Provide framing system; include anchorage, capable of withstanding wind load design pressures of 22 lbs./sq. ft. inward and 22 lbs./sq. ft. outward. The design pressures are based on International Building Code, 2003 Edition.

Uniform Load: A static air design load of 20 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

Structural Load Doors: Corner strength shall be tested per Kawneer's dual moment load test procedure and certified by an independent testing laboratory to ensure weld compliance and corner

integrity.

Air Infiltration Doors: For single acting offset pivot or butt hung entrances in the closed and locked position, the test specimen shall be tested in accordance with ASTM E 283 at a pressure differential of 6.24 psf for single doors and 1.567 psf for pairs of doors. A single 3'-0" x 7'-0" entrance door and frame shall not exceed 0.50 cfm per linear foot of perimeter crack. A pair of 6'-0" x 7'-0" entrance doors and frame shall not exceed 1.0 cfm per linear foot of perimeter crack.

Air Infiltration Storefront Framing: Provide aluminum entrance and storefront framing system with an air infiltration rate of not more than 0.06 CFM per sq. ft. of fixed area (excluding operable door edges) when tested in accordance with ASTM E 283 at an inward test pressure differential of 1.57 psf.

Water Penetration: Provide framing systems with no uncontrolled water penetration (excluding operable door edges) as defined in the test method when tested in accordance with ASTM E 331 at an inward test pressure differential of 8.00 lbf per sq. ft. as defined in AAMA 501.

SUBMITTALS:

Product Data: Submit manufacturer's product specifications, technical product data, standard details, and installation recommendations for each type of entrance and storefront product required. Include the following information:

Fabrication methods.
Finishing.
Hardware.
Accessories.

Shop Drawings: Submit shop drawings for fabrication and installation of entrances and storefronts, including the following:

Layout and installation details, including relationship to adjacent work.
Elevations.
Detail sections of typical composite members.
Hardware, mounting heights.
Anchorages and reinforcements.
Expansion and contraction provisions.
Glazing details.

Hardware Schedule: Submit complete hardware schedule organized into sets based on hardware specified. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Include item name, name of the manufacturer and complete designations of every item required for each door opening.

Samples: Submit pairs of samples of each type and color of aluminum finish, on 8" long sections of extrusions or formed shapes and on 6" square sheets. Where color or texture variations are anticipated, include 2 or more units in each set of samples indicating extreme limits of variations.

Certification: Provide certified test results showing that entrance and storefront systems have been tested by a recognized testing laboratory or agency and comply with specified performance characteristics.

QUALITY ASSURANCE

Installer Qualifications: Engage an experienced Installer who has completed installations of aluminum entrance and storefront systems similar in design and extent to those required for the project and whose work has resulted in construction with a record of successful in- service performance.

Manufacturer's Qualifications: Provide aluminum entrances and storefront systems produced by a firm experienced in manufacturing systems that are similar to those indicated for this project and that have a record of successful in-service performance.

Single Source Responsibility: Obtain aluminum entrance and storefront systems from one source and from

a single manufacturer.

Delivery & Storage: Deliver aluminum entrance and storefront in the manufacturer's original protective packaging. Store aluminum components in a clean dry location away from uncured masonry or concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage. Protect framing material against damage from elements, construction activities, and other hazards before, during and after framing installation.

Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

WARRANTY

Warranty: Submit a written warranty, executed by the manufacturer, agreeing to repair or replace units that fail in materials or workmanship within the specified warranty period. Failures include, but are not necessarily limited to:

Structural failures including excessive deflection, excessive leakage or air infiltration.
Faulty operation.
Deterioration of metals, metal finishes and other materials beyond normal weathering.

Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by Kawneer. In addition, welded door corner construction shall be supported with a limited lifetime warranty for the life of the door under normal use.

PROJECT CONDITIONS:

Field Measurements: Check openings by accurate field measurement before fabrication to ensure proper fitting of work; show measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in the work.

PART 2 - PRODUCTS

MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide systems manufactured by the following or equal as approved by the Architect:

Entrance and Storefront Window System:	Kawneer Company, Inc.* (Guide Specification) EFCO Corporation Oldcastle Building Envelope

Products: Provide the following manufacturer's systems as indicated on the drawings:

Exterior Storefront Window & Door Framing @ All Non-Curtain Wall Conditions: 2" wide x 4 1/2" deep thermally broken framing with 1" insulated glazing and prefinished panels. Glazing position to be front application.

EFCO:	System 433T
Kawneer:	TRIFAB VG 451T Series
Oldcastle:	Series 300 Thermal MultiPlane

Exterior Curtain Wall System: 2-1/2" wide x 6” or 7-1/2" deep framing with 1" insulated glazing . Glazing position to be front application.

EFCO:	System 5600
Kawneer:	1600 Wall System
Oldcastle:	Reliance

Interior Storefront Window & Door Framing @ All Conditions: 2" wide x 4 1/2" deep framing with 1/4" glazing and prefinished panels. Glazing position to be center application.

EFCO:	System 400
Kawneer:	TRIFAB VG 450 Series
Oldcastle:	FG-2000

Exterior and Interior Entrance Doors: Wide stile doors, 5” vertical face dimension, 6 1/2” bottom rail, 1 3/4” depth with 1/4" tempered glazing. See Drawings for door sizes.

EFCO:	Series D500
Kawneer:	Series 500
Oldcastle:	WS-500

MATERIALS:

Aluminum Members: Provide alloy and temper recommended by the manufacturer for strength, corrosion resistance, and application of required finish; comply with ASTM B 221 for extrusions and ASTM B 209 for sheet or plate. Fabricate storefront, doors, frames, and all other extruded aluminum of 6063-T6 alloy and temper.

Member Wall Thickness: Each framing member shall provide structural strength to meet specified performance requirements.

Glazing Gaskets shall be extruded EPDM rubber.

Fasteners: Provide fasteners of aluminum, nonmagnetic stainless steel, or other materials warranted by the manufacturer to be noncorrosive and compatible with aluminum components, hardware, anchors and other components.

Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125" thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.

Exposed Fasteners: Except where unavoidable for application for hardware, do not use exposed fasteners. Exposed fasteners shall be stainless steel or zinc plated steel in accordance with ASTM A 164. Provide Phillips flat-head machine screws for exposed fasteners.

Perimeter anchors shall be aluminum.

Concealed Flashing: Provide 26 gage minimum dead-soft stainless steel, or 0.026" minimum extruded aluminum of alloy and type selected by manufacturer for compatibility with other components.

Brackets and Reinforcements: Where feasible, provide high-strength aluminum brackets and reinforcements; otherwise provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.

Concrete/Masonry Inserts: Provide concrete and masonry inserts fabricated from cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.

Compression Weatherstripping: Provide the manufacturer's standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.

Sliding Weatherstripping: Provide the manufacturer's standard replaceable weatherstripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.

Glass and Glazing Materials: Glass and glazing materials shall comply with requirements of "Glass and Glazing" section of these specifications.

COMPONENTS:

Storefront Window Framing System: Provide storefront and entrance framing systems fabricated from extruded aluminum members of size and profile indicated. Include subframes and other reinforcing members of the type indicated. Provide for flush glazing storefront from the exterior on all sides without projecting stops. Shop-fabricate and pre-assemble frame components where possible. Provide storefront frame sections without exposed seams.

Mullion Configurations: Provide pockets at the inside glazing face to receive resilient elastomeric glazing. Make provisions to drain moisture accumulation to the exterior.

Stile-and-Rail Type Aluminum Doors: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts. Corner construction shall consist of mechanical clip fastening, SIGMA deep penetration and fillet welds.

Extrusions and fasteners shall be the same as framing members. Major portions of the door stiles shall be .125 inch in thickness and glazing moulding shall be 0.05 inch wide x 1-3/4 inches. Vertical stiles and top rail shall be a minimum of 5 inches wide x 1-3/4 inches; bottom rail shall be min. 6-1/2 inches wide x 1-3/4 inches.

Doors shall meet all performance requirements specified.

Finish on doors shall match finish of framing members.

All storefront doors shall be single acting with manufacturer's "Sealair" weatherstripping.

HARDWARE:

See Section 087100 - Finish Hardware

FABRICATION:

General: Sizes of door and frame units, and profile requirements, are indicated on drawings. Variable dimensions are indicated, with maximum and minimum dimensions required to achieve design requirements and coordination with other work.

Prefabrication: Before shipment to the project site, complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible. Disassemble components only as necessary for shipment and installation.

Preglaze door and frame units to greatest extent possible.

Do not drill and tap for surface-mounted hardware items until time of installation of project site.

Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. For hardware, perform these operations prior to application of finishes.

Fabrication: Fabricate components per manufacturer's installation instructions and with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal. Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof. Prepare components to receive anchor devices. Fabricate anchors. Arrange fasteners and attachments to conceal from view.

Mullion and perimeter framing shall be of two-part construction consisting of gutter and face sections, designed to permit unobstructed face glazing with through sight lines and no projecting stops. All exterior face members will be seamless. All vertical and horizontal framing members shall have a nominal face dimension of 1-3/4". All assemblies shall be secured internally by means of face clips of special form, in

such manner as to be positively held against accidental disassembly in the event of glass breakage. Face clips shall be such a design as to provide a non-reversible snap action, and prevent metal to metal contact of the face and gutter sections.

Welding: Comply with AWS recommendations; grind exposed welds smooth and restore mechanical finish.

Reinforcing: Install reinforcing as required for hardware and necessary for performance requirements, sag resistance and rigidity.

Dissimilar Metals: Separate dissimilar metals with zinc chromate primer, bituminous paint, or other separator that will prevent corrosion.

Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

Uniformity of Finish: Abutting extruded aluminum members shall not have an integral color or texture variation greater than half the range indicated in the sample pair submittal.

Fasteners: Conceal fasteners wherever possible.

Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops; at other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.

FINISHES:

General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes. All exposed surfaces shall be free of scratches and other serious blemishes.

Finish: Architectural Class II Clear Anodic Coating conforming with Aluminum Association Standard AA-M10C21A31. Kawneer #17 Clear.

PART 3 - EXECUTION

EXAMINATION

Examine substrates and supports, with the Installer present, for compliance with requirements indicated, installation tolerances, and other conditions that affect installation of aluminum entrances and storefronts. Correct unsatisfactory conditions before proceeding with the installation.

Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

INSTALLATION STOREFRONT SYSTEM:

Comply with manufacturer's instructions and recommendations for installation. Install framing system in accordance with AAMA storefront and entrance guide specifications manual

Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Provide proper support and anchor securely in place.

Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities. Provide alignment attachments and shims to permanently fasten system to building structure.

Separate aluminum and other corrodible metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials. Comply with requirements specified under paragraph "Dissimilar Materials" in the Appendix to AAMA 101-85.

Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.

Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Comply with requirements of Division 7 for sealant, fillers, and gaskets.

Refer to "Glass and Glazing" section of Division 8 for installation of glass and other panels indicated to be glazed into doors and framing, and not preglazed by manufacturer.

Curtain Wall Glazing: Glass shall be outside glazed and held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners spaced no greater than 9" on center.

Curtain Wall Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.

All joints between framing and building structure shall be sealed in order to secure a watertight installation.

FIELD QUALITY CONTROL:

Field Tests: Architect shall select curtain wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.

Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft^2, which ever is greater.

Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 8 psf (383 Pa).

ADJUSTING:

Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.

CLEANING:

Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.

Clean glass surfaces after installation, complying with requirements contained in the "Glass and Glazing" section for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

PROTECTION:

Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

SECTION 085110
ALUMINUM REPLACEMENT WINDOW SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows with fixed sash. B. Factory glazing.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between window frames and adjacent construction.
B. Section 08 8100 – Insulated glass units.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2017.
B. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
C. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2012.
D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
F. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
J. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).
L. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2010).
M. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.
N. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007 (Reapproved 2016)
O. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

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

B. Install full size window unit to confirm design and field conditions before fabricating additional window units.

1.05 SUBMITTALS

A. See Section 01 3300 for submittal procedures.

B. Product Data: Provide component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.

C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.

D. Samples: Submit two samples, 12 by 12 inch in size illustrating typical corner construction, accessories, and finishes.

E. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

F. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

G. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.09 WARRANTY

A. See Section 01 7836 – Warranties, for warranty requirements.

B. Correct defective Work within a 10 year period after Date of Substantial Completion.

C. Provide twenty-year manufacturer’s warranty against failure of glass seal on insulating glass units, including inter-pane dusting or misting.

D. Provide Ten-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN - CW PERFORMANCE CLASS WINDOWS

A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 having Performance Class of CW, and Performance
Grade at least as high as specified design pressure.

B. Hung Windows, Vertical & Horizontal Sliding; with Matching Fixed Units:
1. Basis of Design: Morris Window Series 3100 Operable & stationary.

C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
1. Ram Windows; http://www.ramwindows.com/commercial
2. Stergis Windows, Series 7000
3. Wojan Window & Door Corporation, M-85 Series
4. Morgan Window & Glass, Inc. , M3100

D. Substitutions: See Section 01 6000 - Product Requirements.
1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
1. Provide units factory glazed.
2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
3. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
5. 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.
6. Thermal Movement: Design to accommodate thermal movement caused by 180 degrees F surface temperature without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.

B. Fixed, Non-Operable Type:
1. Construction: Thermally broken.
2. Glazing: Double; clear; low-e 366.
3. Exterior Finish: Clear anodizing
4. Interior Finish: Clear anodizing

2.03 PERFORMANCE REQUIREMENTS

A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
1. Performance Class (PC): CW.

B. Design Pressure (DP): In accordance with applicable codes. (Minimum HC-60)

C. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.

D. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 12.11 psf.

E. Air Leakage: Maximum of 0.1 cu ft/min sq ft per unit area of outside frame dimension, with 6.27 psf differential pressure when tested in accordance with ASTM E283.

F. Condensation Resistance Factor of Frame: 50, measured in accordance with AAMA 1503.

G. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured

on window sizes required for this project.

2.04 COMPONENTS

A. Frames: N o m i n a l 1.5 inch wide by 3.25 inch deep profile, of.062 inch thick section; thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.

B. Sills:.075 inch thick, extruded aluminum; sloped for positive wash; fit under sash leg to 1/2 inch beyond wall face; one piece full width of opening; jamb angles to terminate sill end.

C. Louvers: 475 square inches min. free area, extruded aluminum alloy

D. Insulated Panels: Nominal 1" thick, rigid insulation core with .032 aluminum skin, hardboard reinforcement at inside surface.

E. Fasteners: Stainless steel.

F. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.
   1. Refer to Section 07 9200 for additional requirements.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Concealed Steel Items: Profiled to suit mullion sections; galvanized in accordance with ASTM A123/A123M.

2.06 FINISHES

A. Anodizing in clear and full range of color options.

B. Superior Performing Organic Coatings: AAMA 2604 multiple coat, thermally cured polyvinylidene fluoride system.
   1. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as indicated on drawings.
      a. Manufacturers:
         1) PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
         2) Sherwin-Williams Company; SHER-NAR 5000: oem.sherwin-williams.com/#sle.
         3) Valspar; Fluropon: www.valsparcoilextrusion.com/#sle.
         4) Substitutions: See Section 01 6000 - Product Requirements.

C. Finish Color: As selected by Architect from manufacturer's full range.

D. Apply one coat of bituminous coating to concealed aluminum and steel surfaces in contact with dissimilar materials.

E. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

F. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's instructions. B. Install windows in accordance with ASTM E2112.

C. Attach window frame and shims to perimeter opening to accommodate construction

tolerances and other irregularities.

D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

E. Install sill and sill end angles.

F. Set sill members and sill flashing in continuous bead of sealant.

G. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less

3.04 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.05 CLEANING

A. Refer to Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove protective material from factory finished aluminum surfaces.

C. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

D. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

E. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 087100
FINISH HARDWARE

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work of this section.

Related work, specified elsewhere that should be examined for its effect upon this section:

Section 062023 - Finish Carpentry.
Section 081113 - Steel Doors & Frames
Section 081416 - Flush Wood Doors.
Section 084113 - Aluminum Entrances & Storefronts

DESCRIPTION OF WORK:

Definition: "Finish Hardware" includes items known commercially as builders hardware which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame. Work under this section comprises of furnishing and installing the hardware specified herein and noted on the Drawings for a complete and operational system. For any door or opening not mentioned in the following, furnish hardware of the same type as a similar opening.

Types of finish hardware required include the following:

Hinges
Bolts
Locksets and cylinders
Exit devices and mullions
Push/pull units
Closers
Miscellaneous door control devices
Door trim units
Kick/Mop and Protection plates
Astragals or meeting seals on pairs of doors
Thresholds, sweeps, and weatherstripping for exterior doors
Stops, wall bumpers, and overhead controls
Miscellaneous trim and accessories
Silencers
Key Cabinet (in Vault)

Thresholds for aluminum entrance doors are specified with entrance doors elsewhere in Division 8.

QUALITY ASSURANCE:

Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from only one manufacturer, although several may be indicated as offering products complying with requirements.

Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than 5 years, and who is, or who employs a member of the American Society of Architectural Consultants (AHC), and who will be available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor.

Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements. Provide only hardware which has been tested and listed by UL or FM for types and sizes of doors required and complies with requirements of door and door frame labels.

Where emergency exit devices are required on fire-rated doors (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware".

Life Safety: Provide hardware for compliance with NFPA –101-1999- Life Safety Code.

ADA: Provide hardware in compliance with the Americans with Disabilities Act – Title III – Public Accommodations.

SUBMITTALS:

Product Data: Submit manufacturers technical product data for each item of hardware in accordance with Division-1 section "Submittals". Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.

Hardware Schedule: Submit final hardware schedule in manner indicated below. Furnish six (6) of schedule to Architect for approval. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware. Approval will in no way relieve the contractor of his obligation to supply all hardware required for all openings whether specified or not. The supplier shall furnish the services of an architectural hardware consultant [AHC] to be responsible for the hardware scheduling, keying and coordinating with other trades. The AHC shall be available to meet with the owner and architect to go over the functions of the hardware and the permanent keying requirements.

Final Hardware Schedule Content: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

Type, style, function, size and finish of each hardware item.
Name and manufacturer of each item.
Fastenings and other pertinent information.
Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
Mounting locations for hardware.
Door and frame sizes and materials.
Keying information.

Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

Certification of Compliance: Submit any information necessary to indicate compliance to any or all of these specifications as required.

PRODUCT HANDLING:

Tag each item or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.

Packaging of hardware, is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

Inventory hardware jointly with representatives of the hardware supplier and the hardware installer until each is satisfied that the count is correct.

Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable, so that completion of the work will

not be delayed by hardware losses, both before and after installation.

WARRANTY

All finish hardware shall be supplied with a one [1] year warranty against defects in materials and workmanship, commencing with their delivery to the original purchaser.

T zone bored in lever locks shall carry a seven [7] year warranty.

Heavy duty bored lever locks bi-directional and freewheeling shall carry a five [5] year warranty.

Mortise locksets shall carry a five [5] year warranty.

Exit devices shall carry a standard five [5] year warranty.

Door closer bodies shall carry a ten [10] year warranty.

PART 2 - PRODUCTS

SCHEDULED HARDWARE:

Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware is indicated in the Finish Hardware Data Sheet and Hardware Schedule at the end of this section. Products are identified by using hardware designation numbers of the following.

Manufacturer's product designations: One or more manufacturers are listed for each hardware type required. An asterisk (*) after a manufacturer's name indicates whose product designation is used in the Hardware Schedule for purposes of establishing minimum requirements. Provide either the product designated, or, where more than one manufacturer is listed, the comparable product of one of the other manufacturers which comply with requirements including those specified elsewhere in this section.

MATERIALS AND FABRICATION GENERAL:

Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to Architect.

Manufacturer's identification will be permitted on rim of lock cylinders only.

Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated. Furnish with finish hardware all necessary screws, bolts and other fasteners of suitable size and type to anchor hardware in position for a long life under hard use. All hardware is to be installed with fasteners furnished by the hardware manufacturer. **The use of self drilling tek screws is not permissible. All exit devices, door closers and overhead controls shall be thru bolted to all wood and metal doors.** All thresholds shall be fastened with machine screws and anchors.

Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including

"prepared for paint" in surfaces to receive painted finish.

Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of the type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on the opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.

Tools and Maintenance Instructions for Maintenance: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware.

HINGES, BUTTS AND PIVOTS:

Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

Screws: Furnish Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.

Hinges: Provide five-knuckle, flush tip, template butts with non-rising loose pins. Provide non-removable [nrp] and safety studs [ssf] for exterior outswing doors as shown. Interior doors shall have wrought steel hinges, polished and plated to match the specified finish. Except as otherwise indicated, provide hinge pins as follows:

Steel Hinges: Steel pins.
Non-ferrous Hinges: Stainless steel pins.
Exterior Doors: Continuous stainless steel hinges.
Out-swing Corridor Doors: Non-removable pins.
Interior Doors: Non-rising pins.
Tips: Flat button and matching plug, finished to match leaves.

Number of hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.

LOCK CYLINDERS AND KEYING:

General: Supplier will meet with Owner to finalize keying requirements and obtain final instructions in writing.

Inspection: The hardware supplier shall make a site inspection to be certain that new hardware will fit existing doors and frames. It shall be the responsibility of the hardware supplier to verify and furnish required hardware for all doors depicted on drawings.

Keying: All locks shall be keyed differently except within individual groups, which will be keyed alike as indicated below. All locksets, cylinders, and locked panic devices are to have Schlage removable core cylinders and shall be Great Grand Masterkeyed as specified by the Richmond County Board of Education. Permanent keying shall be handled between the Owner, the Architect and the Lock Supplier.

The key side of all locks will be on the public side.

Metals: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver.

Key Material: Provide keys of nickel silver only.

Keys: No local keying will be acceptable. Only factory registered keys shall be used.

All locksets and cylinders shall be furnished with temporary construction cores. Hardware supplier shall be responsible for securing permanent cores and cylinders for pick up by Richmond County Board of Education at job end.

All locksets shall be Type 1000 Grade as specified.

All cylinders shall be Schlage interchangeable core system.

Key Quantity: Furnish a total of six (6) Grandmaster keys, six (6) Master keys, ten (10) construction masterkeys, and three (3) change keys per cyliner or lockset.

Deliver permanent keys directly to the Owner's representative by the Lock Supplier. This delivery shall be evidenced by a receipt signed by the Owner.

LOCKS, LATCHES AND BOLTS

Mortise Locksets: Provide mortise locksets with 1" throw stainless steel deadbolts with hardened steel rollers and 3/4" stainless steel latchbolts. Locksets shall be reversible without taking the lock case apart. Lock case to be 12 ga. Lock front to be 1/8" thick. Locks to exceed ANSI A156.13, 1000 series, Grade 1.

Bored lever locks specified as such, to meet or exceed the requirements of ANSI A156.2, series 4000, Grade 1 or Grade 2, as shown.

Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.

Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.

Provide roller type strikes where recommended by manufacturer of the latch and lock units.

Lock Throw: Provide 5/8" minimum throw of latch and deadbolt used on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

Provide 1/2" minimum throw on other latch and deadlock bolts.

Flush Bolt Heads: Minimum of 1/2" diameter rods of brass, bronze or stainless steel, with minimum 12" long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

EXIT DEVICES

All exit devices and trim shall be of one manufacturer as hereafter listed and in the hardware sets for continuity of design and consideration of the warranty.

Exit devices to be "UL" listed for life safety. All exit devices for labeled doors shall have "UL" label for fire exit hardware. All devices are to be thru bolted. All devices to conform to NFP-80 and HFPA-101 requirements.

All exit devices to be of a heavy duty, chassis mounting design, with one piece removable covers, eliminating the necessity of removing the device from the door for standard maintenance. All trim to be thru-bolted to the lock stile case. Lever design is to be the same as specified with the locksets.

Rail assemblies of all exit devices are to be of a brass or bronze base material, plated to standard architectural finishes or solid stainless steel as required in the hardware sets. Painted or anodized aluminum finishes or aluminum rails will not be considered acceptable for heavy-duty usage on this project.

CLOSERS AND DOOR CONTROL DEVICES:

All closers shall be heavy duty, surface mounted, hydraulic type, with full rack and pinion construction and shall be the product of a single manufacturer.

The closers shall have adjustable spring power, which allows for closer sizing. Closers shall have separate tamper resistant, non-critical regulating screw valves for closing speed, latching speed and backcheck control as a standard feature.

Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.

At all doors opening beyond 110 degrees use alternate door closer mounting to allow for doors to open up to 180 degrees.

Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.

Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A 117.1 provisions for door opening force and delayed action closing.

DOOR TRIM UNITS:

Fasteners: Provide manufacturer's standard exposed fasteners for door trim units (kick plates, edge trim, etc.; either machine screws or self-tapping screws.

WEATHERSTRIPPING:

General: Except as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf. Provide type, sizes and profiles shown or scheduled. Provide non-corrosive fasteners as recommended by manufacturer for application indicated.

Weatherstripping at Jambs and Heads:

Provide bumper-type resilient insert and metal retainer strips, surface-applied unless shown as mortised or semi-mortised

THRESHOLDS:

General: Except as otherwise indicated provide standard metal threshold unit of type, size and profile as shown or scheduled.

HARDWARE FINISHES:

Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.

Provide finishes which match those established by BHMA or, if none established, match the Architect's sample. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards.

Provide protective lacquer coating on all exposed hardware finishes of brass, bronze and aluminum, except as otherwise indicated.

The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted. **The finish for all hardware in general shall be US26D, satin chrome or US32D, satin stainless steel or as shown in the hardware sets.**

KEY CABINET: Furnish and install in Vault No. E206, one key cabinet - Telkee No. AWC-2505.

PART 3 - EXECUTION

INSTALLATION:

Installer: The hardware is to be installed by experienced finish hardware installers only. Check the hardware against the hardware schedule upon delivery. Store the hardware in a dry, secure location to protect against loss and damage. Install the finish hardware in accordance with the approved hardware schedule and the manufacturers printed instructions. Prefit the hardware before the door finish is applied; remove and reinstall after the finish is complete and dry.

Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.

Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant. Install sealant under the interior edge allowing any water entering through screw holes to weep out the exterior edge. Screw thresholds to substrate with No. 10 or larger screws of the proper type for permanent anchorage and/or bronze or stainless steel which will not corrode in contact with the threshold metal.

ADJUST AND CLEAN:

Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Install and adjust the hardware so that the parts operate smoothly and so that all doors latch, close tightly, and do not rattle. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made. Clean adjacent surfaces soiled by hardware installation.

Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors.

Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

FINISH HARDWARE DATA SHEET

Acceptable Manufacturers

Butts, Spring Hinges:	Stanley*, McKinney, Hager, Bommer
Continuous Hinges	ABH Manufacturing*. Markar
Locksets, Latchsets, Privacys	Schlage Lock Co.*, Sargent
Cylinders, Cores	Schlage* - **No Exception**
Exit Panic Devices, Mullions:	Sargent, Von Duprin*
Bolts, Stops, Silencers:	Rockwood*, Burns, Ives, Glyn Johnson
Push/Pull Units	Rockwood*, Burns, Ives
Kickplates	Rockwood*, Burns, Ives
Overhead Closers	LCN*, Sargent
Thresholds, Sweeps & Weatherstripping	National Guard Products*, Pemko, Reese

* Denotes manufacturers numbers shown elsewhere to indicate project requirements.

FINISH HARDWARE SCHEDULE;

Provide finish hardware for each door to comply with requirements of this section, hardware set numbers indicated on the Door Schedule and the following schedule of hardware sets:

To be provided under Addendum.

END OF SECTION

SECTION 088000
GLASS AND GLAZING

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

SUMMARY:

Extent of glass and glazing work is indicated on drawings and schedules.

Types of work in this section include glass and glazing for:

- Exterior aluminum curtainwall system
- Interior and exterior aluminum storefront entrance doors
- Interior and exterior aluminum storefront window framing
- Interior and exterior hollow metal doors & frames
- Interior hollow metal window / partition framing
- Interior wood doors

SYSTEM DESCRIPTION:

Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading, without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.

Normal thermal movement is defined as that resulting from an ambient temperature range of 120 deg. F (67 deg. C) and from a consequent temperature range within glass and glass framing members of 180 deg. F (100 deg. C).

Deterioration of insulating glass is defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.

Deterioration of coated glass is defined as the development of manufacturing defects including peeling, cracking or other indications of deterioration in metallic coating due to normal conditions of use.

SUBMITTALS:

Product Data: Submit manufacturer's technical data for each glazing material and fabrication glass product required, including installation and maintenance instructions.

Samples: Submit, for verification purposes, 6" square samples of each exterior insulated tinted and interior glass indicated, and 6" long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative of adjoining framing system in color.

Certificate: Submit certificates from respective manufacturers attesting that glass and glazing materials furnished for project comply with requirements.

QUALITY ASSURANCE:

Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FMGA) "Glazing

Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.

Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.

Fire Resistance Rated Wire Glass: Provide wire glass products that are identical to those tested per ASTM E 163 (UL 9) and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of inspecting and testing organization.

Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

DELIVERY, STORAGE, AND HANDLING:

Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

PROJECT CONDITIONS:

Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation, or other causes.

WARRANTY:

General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

Manufacturer's Special Project Warranty on Insulating Glass: Provide written warranty signed by manufacturer of insulating glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure or hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided the manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during the warranty period.

Warranty Period: Manufacturer's standard but not less than 10 years after date of substantial completion.

Manufacturer's Special Project Warranty on Coated Glass Products: Provide written warranty signed by manufacturer of coated glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those coated glass units which develop manufacturing defects. Manufacturing defects are defined as peeling, cracking or deterioration in metallic coating due to normal conditions and not due to handling or installation or cleaning practices contrary to glass manufacturer's published instructions.

Warranty Period: Manufacturer's standard but not less than 5 years after date of substantial completion.

PART 2 - PRODUCTS

MANUFACTURERS:

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

Manufacturers of Clear & Tinted Float Glass, Spandrel Glass Coated Glass, Laminated Glass, Wire Glass:
AFG Industries, Inc.
Cardinal
Guardian
Pilkington Glass, Inc.
PPG Industries, Inc.
Spectrum

Manufacturers of Spandrel Glass:
AFG Industries, Inc.
Cardinal
Ford Glass Division.
Guardian
Pilkington Glass, Inc.
PPG Industries, Inc.
Spectrum

Manufacturers of Laminated Glass:
AFG Industries, Inc.
Cardinal
Ford Glass Division.
Guardian
Pilkington Glass, Inc.
PPG Industries, Inc.
Spectrum

GLASS PRODUCTS, GENERAL:

Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and if applicable, form, finish, mesh and pattern.

Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048 "Standard Specification for Heat-Treated Glass Products" requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

PRIMARY GLASS PRODUCTS:

Float Glass: Type I, (transparent glass, flat) Class 2 (tinted heat absorbing and light reducing), Quality q3 (glazing select), and as follows:
Tinted Glass: Manufacturer's standard tint, with visible light transmittance of 73-75% percent, solar heat gain coefficient (SHGC) of 0.41, and shading coefficient of .47 for 1/4"(6mm) thick glass. **Glass to be equivalent to Vitrio (PPG) *Acuity*.**

Coated Glass: Provide float glass of class indicated which is impregnated with a magnetic sputter vacuum deposition coating, on glass surface indicated, at time of initial manufacture. **Glass to be equivalent to Vitrio (PPG) *Solarban 60* Solar Control Low-E glass.**

Wired Glass: Type III (patterned and wired glass, flat), Class 1 (translucent), Quality q8 (glazing); complying with ANSI Z97.1; 1/4" thick; of form and mesh pattern indicated below:

Polished Wire Glass: Form 1 (wired, polished both sides), Mesh m2 (square).

Refer to requirements for sealed insulating glass units for performance characteristics of assembled units composed of clear and/or tinted glass, coated or uncoated, relative to visible light transmittance, U-values, shading coefficient and visible reflectance.

HEAT TREATED GLASS PRODUCTS:

Uncoated Clear & Tinted Heat Treated Float Glass: Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Class 2 (tinted heat absorbing and light reducing), Quality q3 (glazing select), kind as indicated below.

Kind: FT (fully tempered) where indicated on the Drawings.
Kind: HS (heat strengthened) where indicated on the Drawings or specified in this section.

Coated Clear & Tinted Heat Treated Float Glass: Condition C (other coated glass), Type I (transparent glass, flat), Class 1 (clear), Class 2 (tinted heat absorbing and light reducing), Quality q3 (glazing select), kind as indicated below:

Kind: FT (fully tempered) where indicated on the Drawings.
Kind: HS (heat strengthened) where indicated on the Drawings or specified in this section.

Ceramic-Coated Heat-Treated Spandrel Glass: Condition B (spandrel glass, one surface ceramic coated), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), with ceramic coating applied to second surface and complying with the following requirements:

Kind: HS (heat strengthened) where indicated on the Drawings or specified in this section.
Color: To be selected by Architect

LAMINATED GLASS PRODUCTS:

General: Refer to primary and heat-treated glass requirements relating to properties of uncoated glasses making up laminated glass products.

Plastic Interlayer: Provide glass fabricator's standard polyvinyl butyral interlayer for laminating panes of glass, with a proved record of showing no tendency to bubble, discolor or lose physical or mechanical properties after laminating and installation, in clear or colors and of thickness indicated.

Laminating Process: Fabricate laminated glass using laminator's standard heat-plus-pressure process to produce glass free from foreign substances and air/glass pockets.

Laminated Safety Glass: Two panes of glass of equal thickness, permanently bonded together with not less than 0.060" thick plastic interlayer and complying with requirements indicated below:

Glass Characteristics: Float glass, complying with requirements for class, tint, kind and thickness of each pane:

Color of Plastic Interlayer: Clear.

SEALED INSULATING GLASS UNITS:

General: Provide pre-assembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E 774 for performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and dessicant.

For properties of individual glass panes making up units, refer to product requirements specified elsewhere in this section applicable to types, classes, kinds and conditions of glass products indicated.

Provide heat-treated panes of kind and at locations indicated on drawings or, if not indicated,

provide heat-strengthened panes where recommended by manufacturer for application indicated and tempered where indicated or where safety glass is designated or required.

Performance characteristics designated for coated insulating glass are nominal values based on manufacturer's published test data for units with 1/4" thick panes of glass and 1/2" thick air space.

U-values indicated are expressed in the number of Btu's per hour per sq. ft. per degree F difference.

Performance Classification per ASTM E 774: Class A.
Thickness of Each Pane: 1/4" float & tempered glass.
Air Space Thickness: 1/2".
Sealing System: Manufacturer's standard.
Spacer Material: Manufacturer's standard metal.
Dessicant: Manufacturer's standard; either molecular sieve or silica gel or blend of both.
Corner Construction: Manufacturer's standard corner construction.

Low Emissivity-Coated Insulating Glass Units for Exterior Aluminum Storefront & Curtainwall Door & Window Framing Systems: Manufacturer's standard units with one surface of glass coated with a durable, neutral-colored, low-emissivity, pyrolytic deposited metallic coating on surface indicated, and complying with the following requirements:

Exterior Pane: Tinted float glass, uncoated.
Tint: Acuity

Interior Pane: Acuity, third surface coated with manufacturers Low-E energy saving coating.

Performance Characteristics: **Unit to be equal or better performance than Vitro (PPG) 1" insulated glass unit with Solarban 60 Solar Control Low-E glass**:

Summer Daytime U-value:	0.27
Winter Nighttime U-value:	0.29
Visible Light Transmittance:	73%
Solar Heat Gain Coefficient:	0.41
Shading Coefficient:	0.47
Outdoor visible light reflectance:	1.75

GLAZING SEALANTS

General: Provide products of type indicated and complying with the following requirements:

Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.

Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation. PVC gaskets are typically not compatible with polycarbonate and are not recommended for use in contact with polycarbonate glazing.

Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.

Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

GLAZING GASKETS:

Lock-Strip Gaskets: Neoprene extrusions of size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542; black.

Dense Elastomeric Compression Seal Gaskets: Molded or extruded neoprene or EPDM gaskets, complying with ASTM C 864, of profile and hardness required to maintain watertight seal:

Cellular Elastomeric Preformed Gaskets: Extruded or molded closed cell, integral-skinned neoprene of profile and hardness required to maintain watertight seal; complying with ASTM C 509, Type II; black.

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

Manufacturers of Lock-Strip Gaskets:
Cadillac Rubber & Plastics, Inc.
Maloney Precision Products Co.
The Standard Products Co.

Manufacturers of Preformed Gaskets:
D.S. Brown Co.
Maloney Precision Products Co.
Tremco.

MISCELLANEOUS GLAZING MATERIAL:

Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.

Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.

Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.

Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.

PART 3 - EXECUTION

EXAMINATION:

Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

PREPARATION:

Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

GLAZING, GENERAL:

Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.

Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.

Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

Apply primers to joint surfaces where required for adhesion of sealants, as determined by proconstruction sealant-substrate testing.

GLAZING:

Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6" from corner unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.

Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.

Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement.

Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer. Install pressurized gaskets to protrude slightly out of channel, so as to provide a substantial "wash" away from glass, and to eliminate dirt and moisture pockets.

Install tempered glass in view panels at all interior and exterior non-fire-rated swinging door locations.

Install tempered glass in all storefront entrance doors and adjacent sidelights where applicable.

Install tempered glass in all other locations where shown on the drawings or as required by the applicable building code.

Install tinted glass at all exterior conditions.

Install laminated safety glass at all exterior storefront & curtainwall windows and all hollow metal doors, transoms & sidelights on the far eastern side of the school facing Jimmy Dyess Parkway.

PROTECTION AND CLEANING:

Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.

Protect glass from contact with contaminating substances resulting from construction operations. If, despite

such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.

Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer.

Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

Wash glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Wash glass by method recommended by glass manufacturer.

END OF SECTION

SECTION 088700
ARCHITECTURAL WINDOW FILMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interior/Exterior Window Film

B. Decorative Window Film

C. Privacy Window Film

1.2 RELATED SECTIONS

A. Section 08 40 00 – Entrances, Storefronts, and Curtain Walls: Windows to receive architectural window film

B. Section 08 50 00 – Windows: Windows to receive architectural window film

C. Section 08 60 00 – Roof Windows and Skylights: Glass Skylights to receive architectural window film

D. Section 08 80 00 – Glazing: Windows to receive architectural window film

E. Section 08 90 00 – Glazed Curtain Walls: Curtain Walls to receive architectural window film

1.3 REFERENCES

A. ASTM International (ASTM)

1. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
2. ASTM E 308 - Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.
3. ASTM E 84 - Standard Method of test for Surface Burning Characteristics of Building Materials.
4. ASTM G 26 – Standard Practice for Performing Accelerated Outdoor Weatherizing for Non-Metallic Materials Using Concentrated Natural Sunlight.

1.4 SUBMITTALS

A. Manufacturer's Product Data for specified products.

B. Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.

C. Samples: 4 inch by 4 inch Samples of specified color and pattern for verification.

D. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.

E. Mock ups: Provide one typical office storefront mock up for evaluation of surface preparation techniques and application workmanship.

1. One typical office storefront (Designated by Architect or Interior Designer.)
2. Do not proceed with remaining work until workmanship, color and sheen are approved by Architect.

3. Refinish mock-up area as required to produce acceptable work.

1.5 QUALITY ASSURANCE

A. Obtain all products in this section from a single Manufacturer with a minimum of 5 years' experience.

B. Installer: Installation shall be performed by a trained and qualified installer, specialized, and experienced in work required for this project.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.

C. Product must remain in original plastic bag and boxes and have storage conditions as follows

1. 40 °F – 90 °F (4 °C - 32 °C)
2. Out of direct sunlight
3. Clean dry area
4. Original container
5. Do not stack boxes over six (6) units high. Excessive weight can damage the film
6. Products are not recommended for interior applications where condensation consistently occurs.
7. Handle products in accordance with manufacturer's instructions.
8. Shelf life: 2 years

1.7 PROJECT/SITE CONDITIONS

A. Confirm appropriate substrate is suitable for mounting of glass finish components prior to start of installation.

B. Apply materials when environmental conditions are within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits. Application temperature range is 60 °F – 100 °F (16 °C – 38 °C).

C. Environmental Limitations: Do not install until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 WARRANTY

A. Manufacturer's Standard Warranty: Submit manufacturer's standard warranty document by authorized manufacturer.

1.9 EXTRA MATERIALS

A. Furnish 2 percent extra material at time of installation. Deliver in protective packaging for storage and label contents appropriately.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Acceptable Manufacturers:

1. Basis of Design: Solyx distributed by Decorative Films, LLC
   3909 Cornell Place
   Frederick, MD, 21703
   1-888-657-5224

2. 3M Company – Commercial Solutions Division [CSD]
   3M Center, Building 0220-12-E-04
   St. Paul, MN 55144-1000, USA
   1-888-650-3497

2.2 MATERIAL STANDARD

A. Design based upon Solyx - Eco Dusted SX-3131, All alternates must match transparency/opacity, sheen, and texture.

2.3 MATERIAL PROPERTIES

A. General: Glass finishes field-applied application to glass or plastic material as visual opaque or decorative film.
B. Film: Vinyl
C. Option to Electrocut (by other than Manufacturer)
D. Adhesive: Acrylic, Pressure Sensitive, Permanent
E. Liner: Silicone-coated Polyester
F. Thickness (Film and Adhesive without Liner):

1. Dusted - 3.2 mils (81 microns)
2. Frosted - 4.7 mils (120 microns)

G. Fire Performance: Surface burning characteristics when tested in accordance with ASTM E84, Class A:

1. Flame Spread: 25 maximum.
2. Smoke Developed: 450 maximum

2.4 OPTICAL PERFORMANCE

A. CRYSTAL Dusted Decorative / Privacy Glazing Film:
   1. Ultraviolet Transmittance (ASTM E 903): 27 percent.
   2. Visible Light Transmittance (ASTM E 903, ASTM E308): 85 percent.
   3. Visible Light Reflectance (ASTM E 903): 79 percent.
   4. Solar Heat Transmittance: 76 percent.
   5. Solar Heat Reflectance: 7 percent.
   6. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): 0.93.

B. CRYSTAL Frosted Decorative / Privacy Glazing Film:
   1. Ultraviolet Transmittance (ASTM E 903): 20 percent.
   2. Visible Light Transmittance (ASTM E 903, ASTM E308): 72 percent.
   3. Visible Light Reflectance (ASTM E 903): 12 percent.
   4. Solar Heat Transmittance: 64 percent.
   5. Solar Heat Reflectance: 10 percent.
   6. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): 0.82.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate(s) for compliance. Do not proceed with installation until unsatisfactory conditions have been corrected.
B. Refer to the applicable 3M Technical Data Sheet to determine compatibility of finish to substrate.
C. Do not proceed with installation until unsatisfactory conditions have been corrected.
D. Responsibility for state of surfaces prior to installation to be pre-determined by installation specialist.
E. Scheduling of installation by Owner or its representative implies that substrate and conditions are prepared and ready for product installation per the recommendations of the installation specialist.
F. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.2 SURFACE PREPARATION

A. Comply with all manufacturer's instructions for surface preparation.
B. Thoroughly clean substrate of substances that could impair the overlay's bond, including mold, mildew, oil, grease.
C. Re-clean surfaces with appropriate surface prep solvent and remove any haze or surface contamination.

3.3 APPLICATION

A. Application must be performed by qualified installer.
B. Do not proceed with installation until all finishing work has been completed in and around the work area.
C. Verify pattern prior to material acquisition.
D. Comply with manufacturer's installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
E. Install substrates with no gaps or overlaps. Form smooth, wrinkle-free, bubble-free surface for finished installation.
F. Remove air bubbles, wrinkles, blisters and other defects. Use approved procedures to prevent the formation of air bubbles, wrinkles, blisters and other defects.
G. Refer to the applicable 3M Installation Guide for additional details.

3.4 CLEANING AND PROTECTION

A. Use cleaning methods recommended by architectural surfacing manufacturer for applicable environment.
B. Protect completed glass finish during remainder of construction period
C. Consult with authorized installation specialist for project specifics.

END OF SECTION

SECTION 092216

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.
3. Grid suspension systems for gypsum board ceilings.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.5 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified in accordance with product-certification program of the Certified Steel Stud Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, in accordance with ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

C. Horizontal Deflection: For wall assemblies, limited to **1/240** of the wall height based on horizontal loading of **5 lbf/sq. ft.**

2.2 FRAMING SYSTEMS

A. consumer recycled content: no requirement.

B. Framing Members, General: Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM A1003 requirements for metal unless otherwise indicated.
2. Protective Coating: **ASTM A653/A653M, G40**, hot-dip galvanized unless otherwise indicated.

C. Studs and Tracks: ASTM C645.[**Use either conventional-thickness steel studs and tracks, engineered high-strength drywall steel studs and tracks**] [**or**] [**proprietary steel framing (with continuous lip reinforced knockouts)** [**or**] **proprietary sound stud with closed cell foam isolators-factory assembled].**

1. Steel Studs and Tracks:

   a. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; [**StudRite Drywall Framing**] [**ViperStud Drywall Framing**] or a comparable product by one of the following:

      1) CEMCO; California Expanded Metal Products Co.
      2) Telling Industries.
      3) Prior approved equal

   b. Minimum Base-Metal Thickness: **0.0163 inch**
   c. Depth: **As indicated on Drawings**

2. Engineered High-Strength Steel Equivalent Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally equivalent to conventional ASTM C645 steel studs and tracks.

   a. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; ViperStud or a comparable product by one of the following:

      1) CEMCO; California Expanded Metal Products Co.
      2) Phillips Manufacturing Co.
      3) Telling Industries.
      4) Prior approved equal

   b. Minimum Base-Metal Thickness: **0.0163 inch**
   c. Depth: **As indicated on Drawings**

3. High performing Sound Wall Stud: Factory assembled 3-5/8", 4" or 6" sound isolating double stud using closed cell foam isolators creating sound dampening air gap. Use standard track.
   a. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; **SoundGuard Stud** by one of the following:
      1) Marino\WARE
      2) SCAFCO
      3) Prior approved equal

b. Minimum Base-Metal Thickness: **0.0163 inch**
c. Depth: **As indicated on Drawings**

D. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing **1-1/2-inch** minimum vertical movement.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; Deflex (WSC) or a comparable product by one of the following:

1) CEMCO; California Expanded Metal Products Co.
2) Steel Network, Inc. (The).
3) Prior approved equal

2. Single Long-Leg Track System: ASTM C645 top track with 2-inch deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
3. Double-Track System: ASTM C645 top outer tracks, inside track with 2-inch deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
4. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; **FAS Track**, **SLT Slotted Track** or a comparable product by one of the following:

1) Blazeframe Industries.
2) CEMCO; California Expanded Metal Products Co.
3) ClarkDietrich Building Systems.
4) Metal-Lite.
5) Perfect Wall, Inc.
6) Steel Network, Inc. (The).
7) Telling Industries.
8) Prior approved equal

E. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; FAS Track or a comparable product by one of the following:

a. Blazeframe Industries.
b. CEMCO; California Expanded Metal Products Co.
c. ClarkDietrich Building Systems.
d. Fire Trak Corp.
e. Metal-Lite.
f. Perfect Wall, Inc.
g. Steel Network, Inc. (The).
h. Prior approved equal

F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; Flat Strap or a comparable product by one of the following:

a. CEMCO; California Expanded Metal Products Co.
b. Telling Industries.
c. Prior approved equal

2. Minimum Base-Metal Thickness: **0.0163 inch**

G. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch wide flanges.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; CRC or a comparable product by one of the following:

a. CEMCO; California Expanded Metal Products Co.
b. Telling Industries.
c. Prior approved equal

2. Depth: **1-1/2 inches**
3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch thick, galvanized steel.

H. Hat-Shaped, Rigid Furring Channels: ASTM C645.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; Furring Channel or a comparable product by one of the following:

a. CEMCO; California Expanded Metal Products Co.
b. Telling Industries.
c. Prior approved equal

2. Minimum Base-Metal Thickness: **0.0163 inch**

I. Resilient Furring Channels: 1/2-inch deep, steel sheet members designed to reduce sound transmission.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; **RC1**, **RC-Max**, or a comparable product by one of the following:

a. CEMCO; California Expanded Metal Products Co.
b. Telling Industries.
c. Prior approved equal

2. Configuration: **Asymmetrical** or **hat shaped** as indicated on the drawings.

J. Cold-Rolled Furring Channels: 0.058-inch uncoated-steel thickness, with minimum 1/2-inch wide flanges.

1. Depth: **3/4 inch**
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch diameter wire, or double strand of 0.048-inch diameter wire.

K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; Z Furring or a comparable product by one of the following:

a. CEMCO; California Expanded Metal Products Co.

b. Telling Industries.
c. Prior approved equal

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch diameter wire, or double strand of 0.048-inch diameter wire.

B. Hanger Attachments to Concrete:

1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on [**ICC-ES AC01**] [**ICC-ES AC193**] [**ICC-ES AC58**] [**or**] [**ICC-ES AC308**] as appropriate for the substrate.

a. Uses: Securing hangers to structure.
b. Type: **Torque-controlled expansion anchor**, **torque-controlled adhesive anchor**, **or adhesive anchor**.
c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
d. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy **Group 1**, **Group 2** stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. Flat Hangers: Steel sheet, **1 by 3/16 inch by length required.**

E. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inchwide flanges.

1. Depth: **2 inches**

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
2. Steel Studs and Tracks: ASTM C645.

a. Minimum Base-Metal Thickness: **0.0163 inch**.
b. Depth: **As indicated on Drawings**.

3. Engineered High-Strength Equivalent Gauge Steel Studs and Tracks: ASTM C645.

a. Minimum Base-Metal Thickness: **0.0163 inch**.
b. Depth: **As indicated on Drawings**

4. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.

a. Minimum Base-Metal Thickness: **0.0163 inch**.

5. Resilient Furring Channels: 1/2-inch deep members designed to reduce sound transmission.

a. Configuration: **Asymmetrical or hat shaped** as indicated.

G. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

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

    a. Armstrong World Industries, Inc.
    b. Chicago Metallic Corporation.
    c. USG Corporation.
    d. Prior approved equal

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide **one of** the following:

1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C844 that apply to framing installation.
4. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components in accordance with spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: **16 inches o.c** unless otherwise indicated.
2. Multilayer Application: **16 inches** unless otherwise indicated.
3. Tile Backing Panels: **16 inches o.c.** unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

    a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced **24 inches** o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components in accordance with spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: **48 inches** o.c.
2. Carrying Channels (Main Runners): **48 inches** o.c.
3. Furring Channels (Furring Members): **16 inches** o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension

system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

a. Size supplemental suspension members and hangers to support ceiling loads within **L/360.**

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems [**with hangers used for support**] <**Insert requirements**>.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within **1/8 inch in 12 feet** measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

SECTION 092900
GYPSUM BOARD

PART 1 - GENERAL

1.1 SECTION INCLUDES

1. Gypsum board and accessories.
2. Non-structural metal studs for wall assemblies, soffits and bulkheads.

1.2 RELATED SECTIONS

1. Section 054000 - Cold-Formed Metal Framing; metal studs in exterior wall assemblies.
2. Section 072100 – Thermal Insulation; Acoustical Insulation in interior wall assemblies.

1.3 REFERENCES

1. ASTM International (ASTM):
    1. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
    2. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
    3. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
    4. ASTM B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
    5. ASTM C 475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
    6. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
    7. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members.
    8. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
    9. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
    10. ASTM C 834 - Standard Specification for Latex Sealants.
    11. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board.
    12. ASTM C 844 - Standard Specification for Application of Gypsum Base to receive Gypsum Veneer Plaster.
    13. ASTM C 847 - Standard Specification for Metal Lath.
    14. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications.
    15. ASTM C 1002 - Standard Specification for Steel Self Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
    16. ASTM C 1047 - Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
    17. ASTM C 1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster (Plaster and Stucco Accessories).
    18. ASTM C 1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
    19. ASTM C 1178 - Standard Specification for Glass Mat Water Resistant Gypsum Backing Panel.
    20. ASTM C 1278 - Standard Specification for Fiber Reinforced Gypsum Panel.
    21. ASTM C 1396 - Standard Specification for Gypsum Board.
    22. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
    23. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

24. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
25. ASTM E 413 - Classification for Rating Sound Insulation.

2. AISI North American Specification for the Design of Cold-Formed Steel Structural Members.

3. AISI - Standard for Cold-Formed Steel Framing General Provisions.

4. Gypsum Association (GA):
   1. GA-214 - Recommended Levels of Gypsum Board Finish.
   2. GA-216 - Application and Finishing of Gypsum Panel Products.
   3. GA-238 - Guidelines for the Prevention of Mold Growth on Gypsum Board; Gypsum Association.

5. Underwriters Laboratory (UL) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.4 SUBMITTALS

1. Submit under provisions of Section 01300.

2. Submit manufacturer's certification of product compliance with codes and standards along with product literature and data sheets for specified products. Electronic submittals generated via ClarkDietrich website and submitted electronically are acceptable.

3. Evaluation Reports: Submit evaluation reports certified under an independent third part inspection program administered by an agency accredited by IAS to ICC-ES AC98 IAS Accreditation Criteria for Inspection Agencies.

1.5 QUALITY ASSURANCE

1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

2. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.

3. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-structural steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by, and displaying a classification label, from an independent testing agency acceptable to authority having jurisdiction. Products used in the assembly shall carry a classification label from a testing laboratory acceptable to authority having jurisdiction.
   1. Construct fire-resistance-rated partitions in compliance with tested assembly requirements indicated on the Drawings.
   2. Rated assemblies to be substantiated from applicable testing using the proposed products, by Contractor.
   3. Both metal framing and wallboard manufacturers must submit written confirmation that they accept the other manufacturer's product as a suitable component in the assembly. Acceptance is as follows:
      a. If installation of both products is proper, no adverse effect will result in the performance of one manufacturer's product by the other's products.
      b. Combining products can be substantiated by required assembly tests.

4. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency. Refer to California Office of Noise Control Assembly Listings for further information on wall assemblies shown in drawings.

5. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

1. Protect and store products in manufacturer's unopened packaging until ready for installation per requirements of AISI's "Code of Standard Practice".

2. Deliver and store gypsum board in accordance with GA-238.

1.7 PROJECT CONDITIONS

1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended ASTM C 840 and by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD AND ACCESSORIES

1. Gypsum Wallboard: ASTM C 1396, of types, edge configuration and thickness indicated below; in maximum lengths available to minimize end-to-end butt joints.
   1. Type: Regular, unless otherwise indicated. Type X for fire-resistant rated assemblies and where indicated. Sag-resistant type for ceiling surfaces.
   2. Edges: Tapered.
   3. Thickness: 5/8 inch (16 mm), unless otherwise indicated.

2. Gypsum Backing Board for Multi-Layer Applications: ASTM C 1396 or, where backing board is not available from manufacturer, gypsum wallboard, ASTM C 1396, of type, edge configuration and thickness indicated below, in maximum lengths available to minimize end-to-end joints.
   1. Type: Regular, unless otherwise indicated. Type X for fire-resistant rated assemblies and where indicated. Sag-resistant type for ceiling surfaces.
   2. Edges: Square, non-tapered, or V-tongue and groove.
   3. Thickness: 5/8 inch (16 mm), unless otherwise indicated.

3. Abuse-Resistant Gypsum Wallboard: ASTM C 1278 and ASTM C 1396, of types, edge configuration and thickness indicated below without paper facing and with fiber mesh reinforced backing; in maximum lengths available to minimize end-to-end butt joints.
   1. Type: Regular, unless otherwise indicated.
   2. Thickness: 5/8 inch (16 mm), unless otherwise indicated.

4. Mold and Mildew Resistant Gypsum Board: ASTM C 1396, of type and thickness indicated below to resist mold and mildew; in maximum lengths available to minimize end-to-end butt joints. Board shall score minimum 10 when tested per ASTM D 3273.
   1. Type and Thickness: Regular, 5/8 inch (16 mm) thick, unless otherwise indicated. Type X, 5/8 inch thick, for fire-resistant rated assemblies and where indicated.

5. Water-Resistant Backing Board: ASTM C 1396, with tapered edges and of type and thickness indicated below; in maximum lengths available to minimize end-to-end butt joints.
   1. Types: Regular, unless otherwise indicated. Type X for fire-resistant rated assemblies and where indicated.
   2. Thickness: 5/8 inch (16 mm), unless otherwise indicated.

6. Water-Resistant Backing Board: ASTM C 1178, of type and thickness indicated below with glass mat facing on both sides and acrylic coating on one side; in maximum lengths available to minimize end-to-end butt joints.
   1. Type and Thickness: Regular, 1/2-inch thick, unless otherwise indicated. Type X, 5/8 inch (16 mm) thick, for fire-resistant rated assemblies and where indicated.

7. Gypsum Shaftliner Board, Type X: ASTM C 1396 manufacturer's proprietary fire-resistive liner panels with paper faces.

8. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X: ASTM C 1396, manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.

9. Exterior Soffit Board: ASTM C 1396, with manufacturer's standard edges, of type and thickness indicated.
    1. Types: Regular unless otherwise indicated. Type X for fire-resistant rated assemblies and where indicated.
    2. Thickness: 5/8 inch (16 mm), unless otherwise indicated.

10. Lead-lined Gypsum Board: ASTM C 1396, lead lined, with 2 inch (50 mm) wide strips for lapping at joints. Lead thickness as indicated on drawings.

11. Partitions Closures: Provide extruded aluminum adjustable partition closures at all junctures of partitions with other construction as indicated. Adjustable partition closures shall be spring-loaded assemblies filled with acoustical batt insulation and with finish to match curtain wall system.
    1. Manufacturer: Gordon Inc., "Mullion Mate".

12. Partition End Caps: Provide extruded aluminum partition end caps at all partition termination end. Provide at locations of all adjustable partition closures and other locations indicated. Finish to match curtain wall system.
    1. Manufacturer: Gordon Inc., "Series 910 Special Shapes".

13. Preformed Niches: Provide preformed recessed wall niches, ready to receive tile finish. Provide at showers and other locations indicated.
    1. Manufacturer: Noble Company "Pro Form".

14. Trim Accessories: Provide manufacturer's standard metal trim accessories for gypsum board work, per ASTM C 1047. Provide with either knurled or perforated expanded flanges for nailing or stapling, and beaded for concealment of flanges, in joint compound. Provide corner beads, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, and one-piece control joint beads.
    1. Subject to compliance with requirements, provide drywall trims and accessories by Vinyl Corp.; a division of ClarkDietrich Building Systems or equivalent.

15. Interior Trim Accessories: Provide corner beads, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, and one-piece control joint beads complying with the following requirements:
    1. Materials: Formed metal complying with the following requirements:
        a. Sheet Steel zinc coated by the hot-dip process.
        b. Sheet Steel zinc coated by the hot-dip process or electrolytic process, or sheet steel coated with aluminum..
    2. Subject to compliance with requirements, provide drywall trims and accessories by Vinyl Corp.; a division of ClarkDietrich Building Systems.
    3. Reveals: Extruded aluminum or vinyl.
        a. Products: Vinyl Corp. "No. DC50-50SE".

16. Accessories for Curved Surfaces: Cornerbead formed of metal, plastic, or metal combined with plastic, with either notched or flexible flanges that are bendable to curved radius.

17. Exterior Surface Trim and Accessories: Cornerbead, edge trim, control joints formed from sheet steel zinc coated by the hot dip process per ASTM C 1047, or plastic conforming to ASTM C 1047 Section 4.3 plastic for accessories shall be manufactured from rigid PVC or ABS Plastic not less than 0.028 inch (0.7112 mm) and Section 4.3.1 PVC specification D 3678 Class II or III, in shapes indicated below by reference to ASTM C1047.
    1. Cornerbead on outside corners, unless otherwise indicated.
    2. Edge trim complying with shape LC-bead.

3. One piece control joint formed with V-shaped slot and removeable strip covering slot opening.

18. Exterior Surface Trim and Accessories: Cornerbead, edge trim, control joints formed from PVC conforming to ASTM C1047 Section 4.3 plastic for accessories shall be manufactured from rigid PVC or ABS Plastic not less than 0.028 inch (0.7011 mm). and Section 4.3.1 PVC specification D 3678 Class II or III.
    1. Shapes: as indicated below by reference to ASTM C1047.
        a. Cornerbead on outside corners, unless otherwise indicated.
        b. Edge trim complying with shape LC-bead.
        c. One piece control joint formed with V-shaped slot and removeable strip covering slot opening.
    2. Manufacturer: Vinyl Corp.; a division of ClarkDietrich Building Systems.

19. Soffit Reveals: Prefabricated extruded aluminum or PVC reveals conforming to ASTM C1047.
    1. Manufacturer: Vinyl Corp "No. DC58-50SE".

20. Soffit Vents: Prefabricated extruded aluminum or vinyl soffit vent, with clear anodized finish.
    1. Manufacturer: Vinyl Corp "No. CSJ50-200V".

21. Laminating Adhesive: Special adhesive or joint compound specifically recommended for laminating gypsum boards.

22. Spot Grout: ASTM C 475, setting-type joint compound for type recommended for spot grouting hollow metal door frames.

23. Gypsum Board Screws: ASTM C 1513. Fastening gypsum board to steel members less than 0.033 inch thick. Fastening gypsum board to gypsum board.

24. Steel Drill Screws: ASTM C 1513, for fastening gypsum board to steel members.

25. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing), unfaced mineral fiber blanket insulation in thicknesses shown. Fibers manufactured from glass, slag wool, or rock wool.

26. Thermal Insulation: Thickness and width to fill voids formed by Z-furring members. Unfaced mineral fiber blanket insulation, ASTM C 665, Type I (blankets without membrane facing), in thicknesses shown or extruded polystyrene, ASTM C 578, Type IV, rigid, cellular, polystyrene thermal insulation formed from polystyrene resin using an extrusion process.

27. Isolation Strip at Exterior Walls: Asphalt-saturated organic felt, ASTM D 226, Type I (No. 15 asphalt felt), non-perforated or adhesive backed, closed cell vinyl foam strips that allow fastener penetration without foam displacement, in width to suit steel stud size.

2.2 CEMENT BOARD

1. Basis of Design: Subject to compliance with project requirements, the design is based on the following: USG Corporation, LLC, ”USG Durock Cement Board” .

2. Classification: Cementitious Backer Units: ANSI A118.9, ASTM A108.11 and ASTM C 1325 provide with manufacturer's standard edges.
    a. Thickness: 5/8 inch
    b. Board Length: 8 feet
    c. Board Width: 48 inches
    d. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

3. Minimum bending radius: 6 feet

4. Fastener Requirements: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and application.

a. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: DUROCK Brand Steel or USG Sheathing SF steel drill screws [1-1/4 inch] [1-5/8 inch] [2-1/4 inch] with corrosion-resistant coating.

5. Installation Requirements:

a. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.

2.3 JOINT TREATMENT AND ACCESSORIES

1. Joint Treatment Materials: ASTM C 475; type recommended by manufacturer of sheet products and joint treatment materials for application indicated, unless indicated otherwise.

2. Joint Tape:
   1. Interior Gypsum Board: Paper reinforcing tape.
   2. Exterior Gypsum Board: Paper reinforcing tape.
   3. Mold and Mildew Resistant Backer Board: Glass mesh tape.
   4. Gypsum Base for Veneer Plaster: Paper reinforcing tape.

3. Setting Type Joint Compound: Factory prepackaged, job mixed chemical-hardening powder products for bedding and filling, formulated for uses indicated.
   1. For taping and filling only.
   2. For prefilling gypsum board joints.
   3. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile.
   4. For filling joints and treating fasteners of mold and mildew resistant backing board behind base for ceramic tile.
   5. For topping compound, use sandable formulation.

4. Drying-Type Joint Compounds: Factory prepackaged vinyl-based products complying with the following requirements for formulation and intended use.
   1. Ready-Mix Formulation: Factory-mixed product.
   2. All-purpose compound formulated for use as both taping and topping compound (use for finish (third) coat only.)

5. Exterior Joint Compound: Special chemical-hardening-type for exterior application.

6. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard non-sag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

1. Prior to installation, inspect previous work of all other trades. Verify that all work is complete and accurate to the point where this installation may properly proceed in strict accordance with framing shop drawings.

2. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 GYPSUM BOARD INSTALLATION

1. Gypsum Board:
   1. Gypsum Board Application and Finishing Standards: Comply with ASTM C 840 and GA-216.
   2. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches (610 mm) in alternate courses of board.
   3. Install ceiling boards across framing in the manner which minimizes the number of end-butt joints, and which will avoid end joints in the central area of each ceiling. Stagger end joints a minimum of 24 inches (610 mm).

4. Install wall and partition boards vertically unless otherwise noted.
5. Install exposed gypsum board with face side out. Do not install imperfect, damaged, or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) open space between boards.
6. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges, and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
7. Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.
8. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cut-outs.
9. Form control joints and expansion joints at locations indicated on Drawings, and as recommended by Gypsum Association, with space between edges of boards prepared to receive trim accessories.
10. Cover both faces of steel stud partition framing with gypsum board in concealed spaces except in chase walls that are properly braced internally.
11. Fit gypsum board around ducts, pipes, and conduits.
12. Where partitions intersect open concrete coffers, cut gypsum board to fit profile of coffers and allow 1/4 to 1/2 inch (6 mm to 13 mm) wide joint for sealant.
13. Isolate perimeter of non-load bearing drywall partitions at structural abutments. Provide 1/4 to 1/2 inch (6 mm to 13 mm) space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant. See also 07910.
14. Where sound-rated drywall construction is indicated on Drawings, seal construction at perimeters, control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim, and close off sound-flanking paths around or through construction, including sealing of partitions above acoustical ceilings.
15. Space fasteners in gypsum boards per referenced gypsum board application and finishing standard and manufacturer's recommendations.
16. Install moisture resistant drywall at interior wall surfaces of bathrooms and behind wet wall of kitchen.

2. Cement Board

1. Install cement board floor in shower alcoves as a backing for Hygenic Wall Coverings specified in Section 097216.

3. Accessories:

1. Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.
2. Install metal corner beads at external corners.
3. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, except where plastic trim is indicated on Drawings. Provide type with face flange to receive joint compound except where "U" bead (semi-finishing type) is indicated.
4. Install gypsum board reveals where indicated on Drawings.
5. Install control joints at locations indicated on Drawings, or if not indicated, at spacing and locations required by referenced gypsum board application and finish standard, and approved by Architect for visual effect.

4. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch (1.5 mm) in 10 feet (3048 mm) in any direction.

5. Joint Treatment: Comply with ASTM C 840, GA 214 and GA 216.
1. Level 1: Plenums, service corridors; above ceilings
2. Level 2: Areas of water resistant gypsum backing board under tile; exposed areas

where appearance is not critical.

3. Level 3: Areas to receive heavy or medium textured coatings; heavy-grade wall coverings.
4. Level 4: Areas to receive flat sheen paint finish; light textured coatings; lightweight wall coverings.
5. Level 5: Areas to receive gloss, semi-gloss sheen paints; critical lighting conditions.

3.3 SHAFTWALL INSTALLATION

3.4 A. Attach J-Runners plumb with one another, long leg on shaft side, at floor and structure overhead using power-driven fasteners located 2 inches (51 mm) from each end and 24 inches (610 mm) o.c. between. Cut jamb J-Runners or E-Studs not less than 3/8 inch (10 mm) nor more than 1/2 inch (13 mm) less than distance from floor to structure above. Position J-Runners or E-Studs at wall structural jambs. Do not attach to floor or overhead J-Runners.

3.5 B.With steel frame construction attach J-Runners to beams and J-Runners or E-Studs to columns prior to fireproofing application. Where fireproofing is more than 1 in. thick, position Z-Clips at jambs no more than 4 inches (102 mm) from floor and structure above and no more than 24 inches (610 mm) o.c. between. Attach Z-Clips to steel frame with power-driven fasteners. Attach J-Runners and E-Studs to Z-Clips with two (2) 1/2 inch (13 mm) type S-12 screws. Remove excess fireproofing from insides of J-Runners and E-Studs before installing liner boards.

1. Cut liner boards 1 inch (25 mm) less than distance from floor to structure above; erect vertically into floor and overhead J-Runners, and into jamb J-Runner or E-Stud. Where wall height exceeds maximum length of liner board, position board end joints within upper and lower 1/3 of height from floor to structure above; stagger joints in adjacent boards. Achieve tight fit at mating board ends.

2. Cut Shaftwall Studs not less than 3/8 inches (10 mm) nor more than 1/2 inch (13 mm) less than distance from floor to structure above. Fit first Shaftwall Stud over leading edge of first liner board. Install remaining liner boards and Shaftwall Studs. Do not attach Shaftwall Studs to J-Runners.

3. Do not splice Shaftwall Studs or E-Studs. For wall heights exceeding 16 feet (4877 mm) attach shaftwall studs, E-Studs, or jamb J-runners to floor and overhead J-Runners with two (2) 1/2 inch (13 mm) Type S-12 screws on shaft side and one (1) on floor side. Always fit liner boards tightly into studs or jamb runners. Always fit studs or jamb runners tightly over liner boards.

4. Corners and intersections: Position jamb J-Runners or E-Studs at corners and T-intersections.

5. Door openings: Install E-Studs plumb at each jamb of swinging doors. Install jamb struts plumb with long legs on shaft side at each jamb of elevator doors. Attach jamb strut studs to floor and overhead J-Runners with two (2) 3/8 in (10 mm) Type S-12 screws pan head on shaft side and one (1) on floor side. Attach strut studs to door jamb anchors with two (2) 1/2 inch (13 mm) Type S-12 pan head screws per anchor.

6. For walls above doors miter-cut J-Runners legs and position J-Runner horizontally to fit tightly between strut studs to serve as opening head. At each jamb extend J-Runner upward into overhead J-Runner. Attach J-Runner webs to strut stud webs with 3/8 inch (10 mm) Type S-12 screws spaced not more than 12 inch (305 mm) oc, 2 inches (51 mm) above opening head, and not more than 4 inches (102 mm) from overhead J-Runner, using not less than 3 screws per jamb. Install Shaftwall Studs horizontally at not less than 24 inches (610 mm) o.c.; attach to each mitered jamb J-Runner one (1) 3/8 inch (10 mm) Type S-12 screw shaft side and one (1) floor side.

7. Provide additional liner boards, gypsum shims and fillers at elevator door frames as necessary to maintain fire integrity of the tested labeled frame construction. Construct opening in conformance with frame manufacturer's fire test report; secure copy of fire test report from frame manufacturer and maintain on site for elevator inspector.

8. Small openings: Frame openings with E-Studs or J-Runners at jambs; frame heads and sills with J-Runners. Attach head and sill J-Runners to jambs with two (2) 3/8 inch (10 mm) Type S-12 screws on shaft side and one (1) on floor side.
    1. Do not exceed allowable stresses in Shaftwall Studs, E-studs or J-Runners.

3.6 PROTECTION

1. Protect installed products until completion of project.
2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 093000

CERAMIC TILE

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section includes the following:

Porcelain tile
Ceramic Tile
Trim and Accessories

Related Sections: The following sections contain requirements that relate to this Section:

Division 3 Section 033000 "Concrete Work" for monolithic slab finishes specified for tile substrates.
Division 4 Section 042000 "Unit Masonry".
Division 7 Section 079000 "Caulking & Sealants".

REFERENCES

American National Standards Institute (ANSI):

ANSI A108.1A - Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar.
ANSI A108.1B - Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
ANSI A108.4 - Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.
ANSI A108.5 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
ANSI A108.6 - Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy.
ANSI A108.10 - Specifications for Installation of Grout in Tilework.
ANSI A118.1 - Standard Specification for Dry-Set Portland Cement Mortar.
ANSI A118.3 - Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.
ANSI A137.1 - Specifications for Ceramic Tile.

ASTM International (ASTM):

ASTM C 50 - Standard Practice for Sampling, Sample Preparation, Packaging, and Marking of Lime and Limestone Products.
ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
ASTM C 241 - Standard Test Method For Abrasion Resistance of Stone Subjected to Foot Traffic.
ASTM C 1028 - Standard Test method for Determining the Static Coefficient of Friction or Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull meter Method.

Tile Council of North America (TCNA): TCA Handbook for Ceramic Tile Installation, 2007.

PERFORMANCE REQUIREMENTS

Static Coefficient of Friction: Tile on walkway surfaces shall be provided with the following values as determined by testing in conformance with ASTM C 1028.

1. Level Surfaces: Minimum of 0.6 (Wet).

2. Step Treads: Minimum of 0.6 (Wet).
3. Ramp Surfaces: Minimum of 0.8 (Wet).

SUBMITTALS

General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

Product data for each type of product specified.

Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures, and finishes available for each type and composition of tile indicated. Include samples of grout and accessories requiring color selection.

Samples for verification purposes of each item listed below, prepared on samples of size and construction indicated, products involve color and texture variations, in sets showing full range of variations expected.

Full-size units of each type of trim and accessory for each color required.

Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, plus other information specified.

Mock-Ups: Prior to installation of the work, fabricate mock ups for each type of finish and application required to verify selections made under sample submittals and demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements:

For each type of tile and color required, submit not less than 12 inches square, on plywood or hardboard backing and grouted. Show full repeat of tile pattern. Obtain the Architect's acceptance of mock-ups before start of final unit of work.

QUALITY ASSURANCE

Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

Installer Qualifications: Engage an experienced Installer who has successfully completed tile installations similar in material, design, and extent to that indicated for Project.

DELIVERY, STORAGE, AND HANDLING

Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

PROJECT CONDITIONS

Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

Maintain temperatures at 50 deg F (10 deg C) or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

EXTRA MATERIALS

Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

Tile and Trim Units: Furnish quantity of full-size units equal to 5 percent of amount installed, for each type, composition, color, pattern, and size.

PART 2 - PRODUCTS

GENERAL

ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated.

Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.

ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

Provide selections made by Architect from manufacturer's full range of standard colors, textures, and patterns for products of type indicated.

Provide tile trim and accessories that match color and finish of adjoining flat tile.

MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by the following manufacturer's or by prior approved equal:

TL-1
Manufacturer: Unistarker distributed by Tec-Arte
Series: Venice
Size: 24”x24”
Color: Rialto Group
Grout Color: Custom Building Products Chemical Resistant Epoxy Grouts #543 Driftwood
Application: Floor
Attic Stock: Please provide 3 boxes for Attic stock

TL-2
Manufacturer: Unistarker distributed by Tec-Arte
Series: Venice
Size: 12”x24”
Color: Rialto Group
Grout Color: Custom Building Products Chemical Resistant Epoxy Grouts #543 Driftwood
Application: Wall

TL-3
Manufacturer: DALTILE
Series: Color Wheel Classics
Size: 3”x 6”
Color: Artic White
Finish: Glossy
Grout Color: Custom Building Products Chemical Resistant Epoxy Grouts #642 Ash
Application: Wall

Chemical-Resistant Joint Sealants:
Atlas Minerals and Chemical Co.
Pennwalt Corporation.

TILE PRODUCTS

Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:

1. **Cove Base for TL-1**
Manufacturer: DALTILE
Series: Portfolio
Size: 6”x 12” Cove base piece
Grout joint: 1/16”
Grout Color: Custom Building Products Chemical Resistant Epoxy Grouts #543 Driftwood

2. **Cove transition for TL-1 to TL-2 (First floor Rest Room)**
Manufacturer: Schluter DILEX
Finish: Brushed Antique Bronze
*Contractor to verify transition size to tile prior to ordering

3. **TL-3 Finishing strip (3”x6” Subway transition strip to Gypsum Wall)**
Manufacturer: Schluter SCHIENE E100
Finish: Stainless Steel 304
*Contractor to verify transition size to tile prior to ordering

SETTING MATERIALS

Uncoupling Membrane:

Strata Mat • Laticrete International, Inc.

Mortar Bed Application:

Portland Cement Mortar Bonded Installation: Provide materials to comply with ANSI A108.1A as required for installation method designated, unless otherwise indicated.

Thinset Applications: Use the following setting method for thinset tile applications:

Latex Portland Cement Mortar: Provide materials complying with ANSI A118.4, A118.11 and ANSI A118.15. Material to be a one-step, polymer fortified, thin-set mortar for both interior and exterior applications. Mortar to be equipped with anti-microbial technology.

Product: 254 Platinum • Laticrete International, Inc.

GROUTING MATERIALS

Chemical Resistant Epoxy Grout: Provide materials complying with ANSI A118.3 (Epoxy) and ANSI 118.5 (Furan) performance requirements. Material to be a highly chemical resistant, industrial grade epoxy grout with improved temperature resistance, maximum physical strength, anti-microbial technology, and high resistance to bacteria attack.

Product: CEG-IG 100% Solid Industrial Grade Epoxy Grout • Custom Building Products
Color: See finish schedule (specific tile) for color

MIXING MORTARS AND GROUT

Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

ELASTOMERIC SEALANTS:

Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.

Compatibility: Provide sealants, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.

Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

Chemical Resistant Sealants: For chemical resistant floors, provide sealant compatible with chemical resistant mortars and grouts, approved for use indicated by manufacturers of both mortar/grout and sealant and with chemical resistance properties equivalent to mortar/grout.

MISCELLANEOUS MATERIALS:

Tile Cleaner: Product specifically acceptable to manufacturer of tile and grout manufacturer for application indicated and as recommended by National Tile Promotion Federation, 112 North Alfred St., Alexandria, VA 22134 or Ceramic Tile Institute, 700 N. Virgil Ave., Los Angeles, CA 90029.

PART 3 - EXECUTION

EXAMINATION

Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.

Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

Do not proceed with installation until unsatisfactory conditions have been corrected.

PREPARATION

Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

INSTALLATION, GENERAL

ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.

TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated.

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.

Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.

Joining Pattern: Unless otherwise shown, lay floor tile in grid pattern and wall tile in running bond. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths of 1/16” unless otherwise shown or directed by tile manufacturer.

For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

Expansion Joints: Locate expansion joints and other sealant filled joints, including control, contraction and isolation joints, where indicated. **If not indicated on the drawings, locate expansion joints where any control joint or expansion joint occurs in the underlying concrete substrate.** Do not saw cut joints.

Prepare joints and apply sealants to comply with requirements of referenced standards and sealant manufacturer.

Grout Tile to comply with the requirements of the following installation standards:

For quarry tile grouts (chemical resistant epoxy grout), comply with ANSI A108.6.

FLOOR INSTALLATION METHODS

Quarry Tile & Base: Install tile to comply with requirements indicated below , TCA installation method related to type of subfloor construction, and grout types:

Concrete Subfloor Interior (Thinset): TCA F113-05
Tile: ANSI A108.5
Grout: ANSI A 108.6

Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile unless otherwise indicated.

CLEANING AND PROTECTION

Cleaning: Upon completion of placement and grouting, clean all tile surfaces so they are free of foreign matter.

Remove latex-portland cement grout residue from tile as soon as possible.

Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures that tile is without damage or deterioration at time of Substantial Completion.

When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

SECTION 095113
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:
   1. Acoustical ceiling panels.
   2. Suspension system

B. Related Sections:
   1. Section 09 21 16, Gypsum Board Ceilings.
   2. Section 09 52 23, Metal Acoustical Ceiling Suspension Assemblies.
   3. Section 09 58 00, Integrated Ceiling Assemblies.
   4. Section 23 50 00, Central Heating Equipment.
   5. Section 26 50 00, Lighting.

C. Alternates
   1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products which have not been approved by Addenda, the specified products shall be provided without additional compensation.
   2. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. Abbreviation and Acronyms:

1. CISCA: Ceilings & Interior Systems Construction Association; www.cisca.org

B. Reference Standards:

ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

ASTM C635/C635MStandard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

ASTM C636/C636M Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels

ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E1111/E1111M Standard Test Method for Measuring the Interzone Attenuation of Open Office Components

ASTM E1414/E1414M Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.
D. 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.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
    1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
        a. Flame Spread: 25 or less
        b. Smoke Developed: 50 or less
    2. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which acoustical ceilings function as a fire protective membrane and tested per ASTM E 119.
        a. Protect lighting fixtures and air ducts to comply with requirements indicated for rated assembly.
C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.6 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. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.7 PROJECT CONDITIONS

A. Space Enclosure:

All ceiling products and suspension systems must be installed and maintained in accordance with manufacturer written installation instructions for that product in effect at the time of installation and best industry practice. Prior to installation, the ceiling product must be kept clean and dry, in an environment that is between 32°F (0°C) and 120°F (49°C) and not subject to Abnormal Conditions.
Abnormal conditions include exposure to chemical fumes, vibrations, moisture from conditions such as building leaks or condensation, excessive humidity, or excessive dirt or dust buildup.

The ceilings must be maintained to avoid excessive dirt or dust buildup that would provide a medium for microbial growth on ceiling panels. Microbial protection does not extend beyond the

treated surface as received from the factory, and does not protect other materials that contact the treated surface such as supported insulation materials.

1.8 WARRANTY

A. Manufacturer Warranty: Submit a written warranty executed by manufacturer for a period of 30 years from date of Substantial Completion, agreeing to repair or replace suspension system components that fail or are compromised within the specified warranty period. Failed or compromised parts can include, but are not limited to:

B. :

1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
2. Grid System: Rusting and manufacturer's defects

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

Part 2-PRODUCTS

2.1 MANUFACTURERS

A. Rockfon, 4849 South Austin Avenue, Chicago, IL 60638. 1-800-323-7164; www.rockfon.com

2.2 MATERIALS

A. Acoustical Lay-in Panels: Stone wool panels, “Rockfon Artic®” by Rockfon® with following characteristics:

ASTM E1264 Classification: Type XX, Pattern G.

Edges: SQ

Size: 24” x 24”

Thickness: 3/4”

NRC: 0.75.

AC: 180.

Fire Class: Class A.

Fire Performance:

a. UL 723 (ASTM E84) Flame Spread / Smoke Developed: 0/5.

Light Reflectance: 0.85.

Recycled Content: Up to 37%.

R Value (BTU Units): No Requirement.

2.3 SUSPENSION SYSTEMS – ACT

A. Components: Main Tees and Cross Tees: All suspension main tee and cross tee components are manufactured from commercial quality steel with factory punched cross tee slots, hanger holes and integral bayonet-style end couplings. The main tees are capped with steel capping affixed to a flange and is coated with factory applied baked-on enamel paint.
   1. Structural Classification: Structural Classification Standard: ASTM C635/C635M Intermediate
   2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
   3. Specified Product: “Chicago Metallic Integrity™ 4200 (9/16) Exposed” by ROCKFON, 4849 South Austin Avenue, Chicago, IL 60638. 1-800-323-7164; www.rockfon.com.

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.

D. Perimeter Treatment Components:
   1. Angle Moldings: Manufactured from 0.020” thick steel and finished identical to main tees and cross tees.
   2. Channel Moldings: Manufactured from 0.018” thick steel with factory applied standard white baked-on enamel paint finish.
   3. Shadow Line Moldings: Manufactured from 0.020” thick steel with 3/4” and 3/8” hemmed edge and finished with factory applied standard baked-on enamel paint.

2.4 ALUMINUM CUSTOM TRIM – EXTRUDED

Product/Manufacturer: Infinity Standard by Rockfon

A. Acoustical Metal Trim: Metal Perimeter Trim, “INFINITY™” STANDARD AND ENGINEERED METAL PERIMETER TRIM” by Rockfon with following characteristics:

1. Surface: Smooth
2. Composition: Metal
3. Material: 6063-T5 aluminum
4. Edges: STRAIGHT
5. Color: White
7. Fire Class: Class A.
8. Light Reflectance:
9. Recycled Content: up to 85%

B. Panels and Accessories:
   1. Perimeter Trim:
      a. Manufactured from extruded 6063-T5 aluminum complete with continuous integral slots for attachment of splice plates and grid clips.
   2. Profile:
      a. Rockfon Infinity profile perimeter trim for T-bar type grid acoustical ceilings (6) inch high with 3/4 inch horizontal face. Panels to be (straight) as indicated on approved drawings. (All corners to be factory mitered) (90 degree corner kits are allowed in place of mitered corners on straight sections). Finish to be factory applied painted finish (on outside surface)(360 degrees)(01 White)
   3. Splice Plate:
      a. Manufactured from galvanized steel with set screw for splicing sections of perimeter trim.
      4. Grid Clips:
      a. Manufactured from galvanized steel with set screw for attaching perimeter trim to suspension system members.

5. Paired Bracket:
a. Manufactured from electro-galvanized steel and used for back-to-back Infinity installations. Size bracket to maintain panel vertical surfaces (2-1/4 inch apart with 3/4 inch opening at bottom) (2-7/8 inch apart with 1-3/8 inch opening at bottom).

C. Suspension System:
1. Main Tees:
a. Manufactured from cold rolled steel formed to (9/16) inch wide exposed face x 1 ½ inch height. Ends of tees to be factory cut to length and notched to provide flush fit to perimeter trim.
2. Cross Tees:
a. Manufactured from cold rolled steel formed to (9/16) inch wide exposed face x 1 ½ inch height. Ends of tees to be factory cut to length and notched to provide flush fit of perimeter trim.

D. Acoustical Material
1. Acoutex acoustical non-woven fiber factory adhered to back of perforated panels with 0.70 NRC.
2. Blanket type black vinyl faced one side (1)(11/2) inches thick by (1)(11/2) pounds per cubic foot density with [0.80][0.90] NRC

PART 3 - EXECUTION

3.1 EXAMINATION

A. 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.
B. Examine suspension assemblies, with installer present, for compliance with requirements specified in this and other Sections affecting ceiling panel installation and with requirements for installation tolerances and other conditions affecting performance of acoustic ceiling assemblies.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
B. 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.
C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
D. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
E. 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.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.
B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.
C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 096519
RESILIENT FLOORING

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Extent of resilient flooring and accessories is shown on drawings and in schedules, and includes the following:

Luxury Vinyl Tile
Rubber Wall Base
Rubber Trim Accessories (i.e. reducer strips)

QUALITY ASSURANCE:

Manufacturer: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

Fire Test Performance: Provide resilient flooring which complies with the following fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.

Flame Spread: Not more than 75 per ASTM E 84.
Smoke Developed: Not more than 450 per ASTM E 84.
Smoke Density: Not more than 450 per ASTM E 662.

Installer's Qualifications: Engage Installer who is certified in writing by resilient flooring manufacturer

SUBMITTALS:

Product Data: Submit manufacturer's technical data for each type of resilient flooring and accessory.

Samples for Initial Selection Purposes: Submit manufacturer's standard color charts in form of actual sections of resilient flooring, including accessories, showing full range of colors and patterns available, for each type of resilient flooring required.

PROJECT CONDITIONS:

Maintain minimum temperature of 65°F (18°C) in spaces to receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 55°F (13°C) in areas where work is completed.

Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended bond and moisture test.

PART 2 - PRODUCTS

MANUFACTURERS:

Manufacturers of Luxury Vinyl Tile:
Tarkett

Manufacturers of Rubber Wall Base:
Tarkett (Johnsonite)

Manufacturers of Rubber Accessories:
Tarkett (Johnsonite)

RESILIENT FLOORING COLORS AND PATTERNS:

Provide color and patterns as indicated on drawings, or if not otherwise indicated, as selected by the Architect from manufacturer's standard color line.

TILE FLOORING:

Luxury Vinyl Tile LVT-1: Basis of Design: Tarkett, ID Lattitude Wood, PLWD 4694, 20 MIL, Color: Scout Size 6" x 48, composition as indicated below:

20 mil wear layer, 3.05 mm thickness, Tectonic finish, 20 year limited warranty, Phthalate-free, Floorscore certified, 45% recycled content, Certified Asthma and Allergy friendly.

Complies with ASTM F970, ASTM F925, ASTM E648, ASTM 1914, ASTM D2047 (Static Coefficient of friction for ADA walking surfaces.)

Color: 4694 Scout (wood look)

Luxury Vinyl Tile LVT-2: Basis of Design: Tarkett, Contour, PCWR Woven Reed, 32 MIL, Color: Arrowroot 0977 Size: 6" x 36",composition as indicated below:

32 mil wear layer, 3.05 mm thickness, Commercial Luxury Vinyl Plank with Fiberglass & Exoguard finish

Complies with ASTM F970, ASTM F925, ASTM E648, ASTM 1914, ASTM D2047 (Static Coefficient of friction for ADA walking surfaces.)

Color: Arrowroot 0977

Proposed Alternates: No Proposed Alternates will be excepted unless product is not available from Manufacturer.

TILE FLOORING PATTERNS:

See drawings for locations and patterns of LVT.
RUBBER WALL BASE:

Wall Base: Basis of Design: Tarkett, Tightlock Resilient. Provide rubber base complying with FS SS-W-40; with matching end stops and preformed or **molded inside/outside corner units**, and as follows:

Height: 4".
Thickness: 3.18" mm
Style: Standard top-set cove.
Finish: Matte.
Colors: 283 Toast

ACCESSORIES:

Resilient Edge Strips: Basis of Design: Tarkett (Johnsonite), Wheeled traffic, Slim Line and Reducers, Homogenous composition of Polychloride Vinyl.

Height: Varies dependent on floor transition height. See finish plan and schedule.
Colors: See finish schedule.

Adhesives: Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions. Adhesive to be Low-VOC or Zero-VOC compliant per South Coast Air Quality Management District (SCAQMD).

Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.

Leveling and Patching Compound: Latex types as recommended by flooring manufacturer. Use a good quality Portland cement based compound modified with latex that has a minimal resistance to compression of 246 kg/cm^2 to fill, smooth or level subfloor imperfections under the Texas Granit vinyl tile.

PART 3 - EXECUTION

INSPECTION:

Require Installer to inspect subfloor and wall surfaces to determine that they are satisfactory. A satisfactory subfloor and wall surface is defined as one that is smooth and free from cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.

Perform bond and moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry as well as to ascertain presence of curing compounds.

Do not allow resilient flooring work to proceed until subfloor surfaces are satisfactory.

ACCEPTANCE OF JOB CONDITIONS:

Commencing work: By commencing installation of resilient flooring, the Flooring Contractor signifies acceptance of job conditions relating to his work, and of the requirements of the Contract Documents.

PREPARATION:

Prepare subfloor surfaces as follows:

Use leveling and patching compounds as recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors. Level all rough surfaces and fill cracks and marks with a Portland cement-based patching compound modified with latex

Remove coatings from subfloor surfaces that would prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives, paint, oils, waxes and sealers.

Measure the humidity and pH levels in the cement in compliance with the following standards before installation:

ASTM F 1869, Anhydrous Calcium Chloride test for Moisture levels. The maximum allowable readings are:

- 5 lbs/1,000 sq. ft./24 hours (2.26 kg/92.9 sq. m/24 hours) for the AD-610 and AD-530SF adhesives;

ASTM F 2170, Relative Humidity (RH) test using in situ probes. The maximum allowable reading is 80% RH for AD-610 and AD-530SF.

ASTM F 710, pH levels (test procedure 5.3.1). The readings should be between 8 and 10.

The ASTM test frequency recommendation is 3 measures for the first 1,000 sq. ft. (92.9 sq. m) and one measure for each additional 1,000 sq. ft. (92.9 sq. m).

Ensure Moisture, Relative Humidity and pH tests have all been conducted and measures meet manufacturer's recommendations.

Broom clean or vacuum surfaces to be covered, and inspect subfloor.

Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

INSTALLATION, GENERAL:

Install resilient flooring using method indicated in strict compliance with manufacturer's printed instructions. Extend flooring into toe spaces, door reveals, and into closets and similar openings.

Scribe, cut, and fit resilient flooring to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.

Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.

Install resilient flooring on covers for telephone and electrical ducts, and other such items as occur within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly cement edges to perimeter of floor around covers and to covers.

Tightly cement resilient flooring to sub-base without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient flooring at perimeter of each covered area to assure adhesion.

INSTALLATION OF LUXURY VINYL TILE FLOORS:

Install the flooring according to the latest version of manufacturer’s installation instructions. Use the tools, adhesives, trowel types and procedures recommended in the instructions.

Acclimatize the subfloor, all flooring material and adhesive for 48 hours before, during and after the installation by maintaining the room temperature between 18°C (65°F) and 24°C (75°F). Afterwards, maintain the temperature between 18°C (65°F) and 29°C (85°F).

INSTALLATION OF RUBBER WALL BASE:

Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, **with preformed corner units, or fabricated from base materials with mitered or coped inside corners**. **Mitered outside corners shall not be acceptable.** Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.

On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

INSTALLATION OF ACCESSORIES:

Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

Apply resilient accessories to stairs as indicated and in strict accordance with manufacturer's installation instructions.

CLEANING AND PROTECTION:

Perform following operations immediately upon completion of resilient flooring:

Sweep or vacuum floor thoroughly.

Do not wash floor until time period recommended by resilient flooring manufacturer has elapsed to allow resilient flooring to become well-sealed in adhesive.

Damp-mop floor being careful to remove black marks and excessive soil.

Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient flooring manufacturers.

Protect flooring against damage during construction period to comply with resilient flooring manufacturer's directions.

Cover resilient flooring with undyed, untreated building paper until inspection for substantial completion.

Follow the manufacturer’s instructions when performing initial and regular maintenance procedures.

Clean resilient flooring not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Clean resilient flooring by method recommended by resilient flooring manufacturer.

EXTRA STOCK:

Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.

Tile Flooring: Furnish not less than one box for each 50 boxes or fraction thereof, for each type, color, pattern and size installed.

END OF SECTION

SECTION 09657
SAFETY SHEET VINYL FLOORING

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes: This section includes labor, materials and other services necessary to complete resilient sheet flooring, safety and slip resistant sheet vinyl flooring systems and accessories work. Conform with requirements of all Sections of Division 1, General Requirements, as it applies to the work of this Section, including but not limited to the following:
- .1 Coordination of start date and timeframe.
- .2 Coordination of substrate preparation.
- .3 Coordination of moisture and pH testing.
- .4 Coordination with moisture mitigation if required.
- .5 Coordination of proper plumbing fixtures for connections with flooring.
- .6 Floor installation and heat welding of all seams, horizontal and vertical.

.2 Related Sections:
- .1 Section 03300 - Cast-in-Place Concrete: Concrete finishing.
- .2 Section 06100 - Rough Carpentry: Plywood floor sheathing.
- .3 Division 7 - Thermal and Moisture Protection.
- .4 Division 15 - Mechanical.

1.2 REFERENCES

.1 **ASTM D 2047**, Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
.2 **ASTM E 648/NFPA 253**, Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
.3 **ASTM E662**, Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
.4 **ASTM F710**, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
.5 **ASTM F 970**, Standard Test Method for Static Load Limit.
.6 **ASTM F1482**, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring.
.7 **ASTM F1303**, Standard Specification for Sheet Vinyl Floor Covering with Backing.
.8 **ASTM F2170**, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
.9 **(RFCI)** Resilient Floor Covering Institute
1. RFCI Standard Slab Moisture Test Method (Calcium Chloride Method) as a supplementary test method to ASTM F2170.

.10 **Underwriters Laboratories of Canada (ULC)**
1. CAN/ULC-S102.2, Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies

.11 **ASTM F 3010 Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings**
.12 **DIN 51130 Slip Resistance Test**
.13 **ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials**
.14 **RFCI Recommended Work Practices for Removal of Resilient Floor Covering**

1.3 SUBMITTALS

.1 Product Data: Submit manufacturer’s current printed product literature, specifications, installation instructions, and field reports in accordance with Section 01330 - Submittal Procedures.

.2 Shop Drawings: Submit shop drawings to indicate materials, details, and accessories in accordance with Section 01330 - Submittal Procedures including but limited to the following:
- .1 Submit a cut diagram indicating seam locations and roll direction. Use mitered seam layouts

for corners when changing directions 180 degrees (e.g. when running material down corridors which bisect at a right angle), unless approved otherwise.

.3 Samples: Submit duplicate 6" x 9" (152 mm x 228 mm) sample pieces of sheet material, 6" (152 mm) long [gulley edge] [cap strip] [joint cover strip] [cove former] in accordance with Section 01330 - Submittal Procedures.

.4 Closeout Submittals: Submit the following:
.1 Operation and Maintenance Data: Submit manufacturer's operation and maintenance data for incorporation into manual specified in accordance with Section 01780 – Closeout Submittals. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

1.4 QUALITY ASSURANCE

.1 Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
.1 Training: Installer who has attended an Altro flooring installation training clinic or who has successfully installed Altro in three previous wet-area environments.
.2 Awarded flooring contractor must use in-house installers.
.3 Awarded flooring contractor must be able to provide recent Altro references with contacts.

.2 Mock-ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods, including concrete substrate testing.
.1 Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
.2 Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.

.3 Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, manufacturer's warranty requirements, and installer qualifications.

.4 Bond Test: Install multiple bond tests using 3' x 3' pieces of material adhered with the appropriate adhesive to verify quality of adhesion. Remove half of each piece after 24 hours, then the other half after 48 hours. To help assess resistance to indentation, place end user equipment onto a sample for 72 hours. Document all results.

.5 Regulatory Requirements: Provide slip resistant sheet vinyl safety flooring in compliance with the following:
.1 Americans with Disabilities Act Architectural Guidelines (ADAAG)
.2 Occupational Safety and Health Administration (OSHA)

1.5 SITE CONDITIONS

.1 Temperature Requirements: If storage temperature is below 65F (18C) or the floor temperature is below 50F (18C), the Altro Aquarius flooring product must be moved to a warmer place and allowed to reach this temperature before unrolling or installation. For further information, refer to current Altro Installation Practices and Quick Facts.

.2 Maintain air temperature and structural base temperature at flooring installation area between 68F (20C) and 80F (26C) for 48 hours before, during and 24 hours after installation.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
.2 Deliver, store and handle resilient flooring materials in accordance with Section 01610 - Basic Material Requirements.
.3 Deliver materials in manufacturer's original, unopened, undamaged containers with

identification labels intact.

.4 Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.

.5 Store rolls in dry locations. Stand rolls on end. Protect and secure rolls from falling.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Deposit all packaging materials in appropriate container on site for recycling or reuse.

.2 Avoid using landfill waste disposal procedures when recycling facilities are available.

.3 Keep all discarded packaging away from children.

1.8 WARRANTY

.1 Warranty period for Altro Aquarius shall be 10 years commencing on date of substantial completion.

PART 2 PRODUCTS

2.1 SAFETY FLOORING

Specifier Note: Altro Aquarius flooring is a combination of high quality vinyl content, aluminum oxide and coloured quartz grains throughout the thickness, silicon carbide grains in the surface layer and a non-woven polyester/cellulose backing with glass fibre reinforcement.

.1 Safety Sheet Vinyl Manufacturer: Aquarius by Altro.

.1 CANADA: 6221 Kennedy Rd, Unit 1, Mississauga ON, L5T 2S8
Toll Free: 800.565.4658 Tel: 905.564.1330 Fax: 905.564.0750

.2 **Acceptable material**: Altro Aquarius (measurements and product weights listed are approximate): Slip Resistance ASTM D2047 .88 Dry, 1.03 Wet; Thickness: 0.08” (2 mm); Roll Width: 6' 7" (2 m); Roll Length: 66' (20 m); Roll Weight: 220 lb (100 kg).

Product & color code: LIGHTHOUSE PX2001

2.2 ACCESSORIES

Including but not limited to:

.1 **Vinyl welding rod**: Acceptable material:
- .1 Altro Weld Rod

.2 **Cove former**: Acceptable material, sized to suit application:
- .1 Altro Cove former 20R - 24 mm (1") radius.

.3 **Cap strip**: Acceptable material, sized to suit application,Vinyl
- .1 Altro Cap Strip C7.

.4 **Subfloor Filler and Leveler**: Use only grey Portland cement-based “moisture tolerant” underlayments, and patching compounds. Use for filling cracks, holes or leveling. White gypsum materials are not acceptable.

.5 **Metal edge strips**:
- .1 Aluminum extruded, smooth, [mill finish] stainless steel with lip to extend over flooring.

.6 **Adhesives**
- .1 Altrofix 30 – 2-part Polyurethane adhesive
- .2 Altrofix 31 – 2-part Polyurethane fast set version for repairs and small areas.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog, installation instructions found at www.altrofloors.com.

.2 Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.2 PREPARATION

.1 Remove substrate paint, coatings and other substances that are incompatible with adhesives or contain soap, wax, oil, solvents, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

.2 Permanent and non-permanent markers, pens, crayons, and paint shall not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.

.3 Safety flooring shall be installed over subfloors conforming to ASTM F710 for concrete and other monolithic floors or ASTM F1482 for wood subfloors.

.4 Always conduct moisture tests per ASTM F-2170 on all concrete slabs regardless of age or grade level. ASTM F-2170 Internal Relative Humidity (IRH) test results must not exceed 90%. Alkalinity Testing per ASTM F710 with an acceptable range of 7-9.9 pH.

.5 Do not proceed with work until results of moisture condition tests are acceptable.

.6 When patching, a ***moisture tolerant*** patching compound must always be used.

.7 Contingency for High Moisture Readings in Concrete:

- .1 If at the time of installation the moisture readings are in excess of Altro's recommendations, the General Contractor shall employ a means of Moisture Mitigation. This includes, but is not limited to, the following methods:
  - .1 Application of a Moisture Reduction Barrier (MRB)
  - .2 Temporary use of dehumidification equipment.
  - .3 Postponing of the flooring installation start time.
  - .4 A budget should be provided to the general contractor for use of an MRB

.8 Wood Subfloors: Confirm wood subfloors meet the following requirements.

- .1 Must conform to ASTM F-1482 Standard Guide to Wood Substrates.
- .2 Wood subfloors shall have a minimum 18 inch (45.7 cm) of cross-ventilated space beneath the bottom of the joist. The floor must be rigid, free of movement.
- .3 Single wood and tongue and groove subfloors shall be covered with a minimum 1/4 inch (6.4 mm), 3/8 inch (9mm) or 1/2 inch (12.7 mm) APA approved underlayment plywood as follows.
- .4 Use 1/4 inch (6.4 mm) thick underlayment panels for boards with a face width of 3 inches (76 mm) or less.
- .5 Use 1/2 inch (12.7 mm) thick underlayment panels for boards with a face width wider than 3 inches (76 mm).
- .6 Do not install directly on OSB (Oriented Strand Board), particleboard, chipboard, luan or composite type panels unless specifically designed and approved by the panel manufacturer for use as a resilient flooring underlayment.

3.3 INSTALLATION

.1 Installation: Install Altro Aquarius in accordance with the current posted Altro Installation Practices at www.altrofloors.com, Downloads, Technical Documents, Installation Guides. All Seams shall be heat welded with Altro Weldrod™ only. Failure to install Altro Aquarius flooring in accordance

with recommended procedures will void the Altro Limited Product Warranty.

.2 Detailing Guide for Wet Areas: can be found on our website at www.altrofloors.com, Downloads, Technical Documents, Installation Guides. The installation of Altro Aquarius in a wet environment is a system installation. All circular drain covers must be modified in the field or specified by the architect to be Surface-Membrane Clamping Style Drains and installed per the instructions in the Altro Flooring installation guide. The Gulley Edge/Angle, AltroMastic, Cove Former, and Cap Strip Accessories are necessary accessories for a water-tight and manufacturer-compliant installation.

.3 Drains: Fit Altro Safety and Slip Resistant Flooring and mechanically fasten to drain outlets to ensure a permanent, watertight installation.

.1 **New Round Drains**: Install round flash clamping ring type drains to accommodate Altro safety flooring. Install drains to fit flush with surrounding floor surface. Acceptable drain manufacturers and drain types include Zurn Z 415-H, Mifab F1100-FC, Wade 1100-FC, Josam 30000-AD, Watts FD 100-FC and Smith 2051. Please refer to Altro's current Installation Guide for approved drain manufacturers and styles, www.altrofloors.com, Downloads, Technical Documents, Installation Guides. If Surface-Clamping Style Drains are not utilized, the Flooring Sub-Contractor MUST modify the drain covers to mechanically fasten flooring to drain outlets.

.2 **Existing Drains:** When existing drains are to be used, provide mechanically fastened stainless steel drain rings over all-round drain outlets. Fit rings over slip resistant sheet vinyl and permit inside diameter that will allow clean-out plate to be removed after installation. Drill into concrete to accommodate lead or plastic anchors. Screw drain rings to create a tight seal with beveled head stainless steel screws.

.3 **Square and Rectangular Drains and Floor Sinks**: Install Altro Gully Edge GE25RE or GE35RE around perimeter of drain which has been set in concrete in accordance with Altro Installation Guide. Do not use Altro Gully Edge around drains set in wood floors. Provide stainless steel strips, mechanically fastened with stainless steel screws. Use stainless steel strips in other areas where it is not practical to use Altro Gully Edge.

.4 Coved Installation: Where Altro flooring is coved up wall surfaces and other abutments, installation shall be in accordance with Altro Installation Practices using the following accessories:

.1 At standard wall finishes: Use Altro C5 vinyl cap strip to accommodate sheet vinyl to a height as indicated; adhere with contact tape.

.2 At ceramic tile, Altro Whiterock semi-rigid wall cladding or FRP paneling: Use Altro C8 Vinyl Cap Tile Strip or C4 cap, respectively.

.3 When coving up the wall; at juncture of vertical and horizontal surfaces: Use Altro Vinyl Cove Former 901: install with contact tape.

.4 Top set cove base: Install in accordance with manufacturer's instructions.

3.4 CLEANING

Specifier Note: Altro Aquarius is unaffected by surface water and most chemicals which do not have a solvent action on vinyl. Certain organic solvents and chemicals, including asphalt, can cause staining, as might some antioxidants found in certain types of rubber used in mats, wheels and tires. Acids and dyes may affect the colour, which should be selected accordingly. Contact Altro for information about the effect of chemicals on Altro flooring.

.1 Cleaning: Remove temporary coverings and protection of adjacent work areas.

.1 Repair or replace damaged installed products.

.2 Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.

.3 Current recommended maintenance procedures can be found on the Altro website at www.altrofloors.com, Downloads, Technical Documents, Maintenance Guides.

.2 Protection:

.1 Sweep or vacuum all construction debris and dust first, then clean the flooring with AltroClean 44 /AltroClean 44 Plus using an auto scrubber.

.2 Cover and protect finished installation from damage from other trades using a non-staining, temporary floor protection system, such as reusable textured plastic sheeting.

.3 Never use tapes on the surface on the finish flooring, Sharpies, pens, crayons or construction markers on either the finish flooring or the substrate.

.4 No traffic for 24 hours after installation, unless approved by Altro technical.

.5 No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.

.6 Wait 72 hours after installation before performing initial cleaning. Start a regular maintenance program after the initial cleaning as recommended by manufacturer

3.5 PROTECTION

.1 Cover and protect finished installation from damage from other trades using a non-staining, temporary floor protection system, such as a reusable textured plastic sheeting.

.2 Altro Aquarius should be covered and protected from all other trades during construction with a suitable non-staining protective covering without taping to the surface of the flooring.

END OF SECTION

SECTION 096813
CARPETING

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

SUMMARY:

Extent, location and details of each type of carpeting are indicated on drawings, and in finish schedule.

Scope: Work of this section includes furnishing and installation of carpeting (carpet tiles), vinyl strips, adhesives and accessories required to properly install glue down on all carpet tile in a workmanlike manner.

Related Sections: The following section contains work and materials that relate to this section:

> Rubber wall base and rubber tile flooring is specified in Division 9 Section 096519 Resilient Flooring.

QUALITY ASSURANCE:

Manufacturer Qualifications: Carpet manufacturer shall have been manufacturing commercial carpeting continuously for a period of 25 years.

Carpet other than that specified under "products" must be approved by the Architect ten days prior to bid date. To obtain approval the carpet contractor shall submit to the Architect samples of all materials specified herein. These samples shall be accompanied by a certification from the manufacturer certifying equal qualification with every requirement as specified herein.

Installer Qualifications: All work shall be done only by authorized contractor and installation crews endorsed by the manufacturer. All adhesives, seam sealers and seam cleaners must be those approved by the manufacturer.

Notice is hereby made that strict adherence to this Specification will be required by the Architect and that the Contractor shall receive no compensation for losses in replacement of goods disapproved. The Contractor shall certify that all material supplied against this contract meet or exceed the standards established under "Products", and are guaranteed free from manufacturing defects for three (3) years.

Single Source Responsibility: Provide material produced by a single manufacturer for each carpet type.
SITE VISIT The Contractor shall visit the site and be responsible for all measurements and job conditions. The carpet contractor shall visit the site and shall inspect job conditions relating to work of this section, and shall make job measurements for all areas to receive carpet. Carpet contractor shall verify that all areas to receive carpet are free of moisture, dirt and surface irregularities. No work shall be begun until all deficiencies have been corrected.

Acceptance: By commencing work on carpet installation, the carpet contractor signifies acceptance of all job conditions affecting his work
HANDLING AND STORAGE: All carpet shall be delivered to the job site in original mill wrappings with each roll having its register number properly attached, clearly marked as to size, dye lot, and materials.

Materials shall be stored in an enclosed and dry area protected from damage and soiling. Coordinate location or storage area within building with General Contractor or Principal.

SUBMITTALS:

Product Data: Submit manufacturer's product literature and installation instructions for each type of carpeting material and installation accessory required. Include methods of installation for each type of substrate. Submit written data on physical characteristics, durability, resistance to fading and flame resistance characteristics.

Samples for Initial Selection Purposes: Submit manufacturer's standard size samples and color yarns showing full range of colors, textures and patterns available for each type of carpet required.

Samples for Verification Purposes: Submit the following:

Full sized sample of modular carpet tile required.

Prepare samples from same material to be used for the work.

Drawings: Submit two (2) drawings, for approval, showing layout of seams, all edge conditions and conditions where joined or butted to adjacent materials.

Maintenance: Submit manufacturer's maintenance manual in three (3) copies.

GUARANTEES AND WARRANTIES:

Upon completion, the carpet contractor must submit a certificate guaranteeing the installation to be free of defects in workmanship for a period of one year. The certificate shall include the statement that: "The carpet contractor shall, at his own expense and upon written notice from the Architect, promptly correct/replace any and all improper work and material that may become apparent within three years (36 months) after the date of final completion."

Carpet manufacturer must be able to certify by register and roll numbers that the carpet shipped for this project complies with all requirements of the Specifications subject to normal manufacturing tolerances.

Manufacturer shall furnish to the Owner their standard warranty for the carpet selected for the manufacturer's lifetime warranty. Written warranties must be included with product submittals.

SEQUENCING AND SCHEDULING:

Sequence carpet installation with other work to minimize possibility of damage and soiling during remainder of construction period.

MAINTENANCE:

Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated traffic and use conditions. Include precautions against materials and methods which may be detrimental to finishes and performance.

Replacement Materials: After completion of work, deliver not less than 5% of each type, color, and pattern of carpeting, exclusive of material required to properly complete installation. Furnish accessory components as required. Furnish replacement materials from same production run as materials installed. Package replacement materials with protective covering, identified with appropriate labels.

PART 2 - PRODUCTS

CARPET:

General: All carpet shall be first quality of American manufacturer and all yarn shall be of domestic origin.

Carpet manufacturers and products:

Milliken (CPT-1): *Obex CutX, Color: FZX5-27 FIZZ (Walk-off)*
Pattern: CutX
Fiber Type: Wear On Nylon and Monofilament
Dye Method: Printworks Precision Dyed
Pile Height: 0.186" (4.72MM)
Stitches Per Inch: 9.5 per inches
Backing: PVC-Free WellBAC + Comfort Plus cushion

Density Factor: 4,684 oz/yd^3
Standard Size: 19.7" x 19.7"
Guarantee: Lifetime Face Fiber Wear, Lifetime Antistatic, Lifetime Floor Compatibility, Lifetime Color Pattern Permanency, Lifetime Floor Release, Lifetime Cushion Resiliency, Lifetime Moisture Resistance, Lifetime Delamination of Backing, Lifetime Dimensional Stability, Lifetime Tuft Bind, Lifetime Edge Ravel

Testing:
Flammability: Flooring Radiant Panel ASTM E-648 Class I
NBS Smoke Chamber: ASTM E-662 450 or less,
Electrostatic propensity: less than 3.5 kv

Proposed Alternates: No Proposed Alternates will be excepted unless product is not available from Manufacturer.

ACCESSORIES:

Resilient Edge Strips: Basis of Design: Tarkett (Johnsonite), Wheeled traffic, Slim Line and Reducers, Homogenous composition of Polychloride Vinyl.

Height: Varies dependent on floor transition height. See the finish plan and schedule.
Colors: See finish schedule.

Miscellaneous Materials: As recommended by manufacturers of carpet and other carpeting products; selected by Installer to meet project circumstances and requirements.

PART 3 - EXECUTION

INSPECTION: Report to the General Contractor and Architect, in writing, any imperfections, unacceptable conditions and/or corrections required to be made before commencing work of this section. Commencing work of the section denotes acceptance of subcontractor and all surfaces and conditions affecting the work of this section.

PROPERTY DAMAGE BY THE SUBCONTRACTOR

Any damage done to the paint, walls, floors, etc. shall be the responsibility of the carpet subcontractor. Required repairs shall be made by the proper trade contracted on the work of this project who will be required to make the repair and paid by the carpet subcontractor for the repair work.

PREPARATION:

Repair minor holes, cracks, depressions, and rough areas using material recommended by carpet or adhesive manufacturer.

Clear away debris and scrape up cementitious deposits from surfaces to receive carpeting; vacuum clean immediately before installation. Check concrete surfaces to ensure no dusting through installed carpet; apply sealer where required to prevent dusting. Surface to receive carpet must be free of dirt, visible moisture and irregularities.

Carpet installer is responsible for the cleanliness of the floor. Existing or previously treated substrate, on existing floor, with respect to wax, soap or other residual buildup must be removed prior to installation.

INSTALLATION: Existing or previously treated substrate, on existing floor, with respect to wax, soap or other residual build-up must be removed prior to installation.

Carpet shall be installed in strict accordance with the manufacturer's recommended procedures as outlined in *Manufacturer's Carpet Specifier's Handbook*.

Installation Adhesive: Adhesive shall be as recommended and provided by manufacturer. Where

primer/sealers are used, their compatibility with adhesive must be verified.

CLEAN UP:

Upon completion of the installation, the contractor shall remove all waste and excess materials, all tools and equipment, and shall carefully and thoroughly vacuum the entire floor surface with an upright beater-bar type vacuum cleaner to the Architect's satisfaction.

EXCESS CARPET:

All usable pieces of carpet not necessary to complete the work are to be left on the job site and placed in an orderly manner in such areas as designated by the Owner. A piece of scrap carpet shall be placed as a rug at the entrances to any carpeted area to prevent soiling. Carpet found by the architect to be soiled and incapable of being cleaned at the time of final acceptance shall be replaced with new carpet to the Architect's satisfaction.

MAINTENANCE

The carpet manufacturers shall demonstrate care and maintenance to the designated staff, at the completion of the project. This demonstration shall be presented by a knowledgeable representation of the manufacturer, whose responsibilities include installation and maintenance. The seminar shall be complete and all inclusive concerning carpeting methods and chemical usage. After this demonstration, the carpet representative shall document this by a letter stating the date, time and listing of all present at the meeting. The Principal of the school shall sign this letter verifying that all parties maintaining this floor has been instructed how to maintain this floor. This letter will be submitted to the owner with the final pay request.

END OF SECTION

SECTION 097216
HYGENIC WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section includes labor, materials and other services necessary to complete vinyl wall coverings.

B. Conform with requirements of all Sections of Division 1, General Requirements, as it applies to the work of this Section.

1.02 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete: Concrete finishing

B. Section 06100 - Rough Carpentry: Plywood floor sheathing

C. Division 7 - Thermal and Moisture Protection

D. Division 15 - Mechanical

1.03 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. **American Society for Testing & Materials (ASTM):**

1. ASTM E 84-05 Standard Test Method for Surface Burning Characteristics of Building Materials. CLASS A

2. ASTM D5420 Gardner Impact Exceeds 160 inch pounds

C. **Underwriters Laboratories of Canada (ULC)**

1. CAN/ULC-S102, Surface Burning Characteristics

1.04 SYSTEM DESCRIPTION

A. Performance Requirements: Provide Altro Tegulis wall covering which has been manufactured by Altro and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer’s current printed product literature, specifications, installation instructions, and field reports in accordance with Section 01330 - Submittal Procedures.

B. Shop Drawings: Submit shop drawings to indicate materials, details, and accessories in accordance with Section 01330 - Submittal Procedures including but limited to the following:

1. Submit a layout diagram indicating the location of each panel and joining method.

C. Samples: Submit duplicate sample pieces of Altro Tegulis material, as well as accessory pieces in accordance with Section 01330 - Submittal Procedures.

D. Quality Assurance Submittals: Submit the following:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

2. Manufacturer's Instructions: Current published manufacturer's installation and maintenance instructions.

3. Manufacturer's Field Reports: Specified herein.

E. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

2. Warranty: Warranty documents specified herein.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

1. Experienced installers who have installed similar products, in similar environments.

B. Mock-ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Consultant's acceptance of finish color, texture and pattern, and workmanship standards.

1. Mock-Up Size: [Specify mock-up size.]

2. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.

3. Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.

C. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

1.07 DELIVERY, STORAGE & HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Deliver, store and handle Altro Tegulis wall panels in accordance with Section 01610 - Basic Material Requirements.

C. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer. Panels should be stored flat and be pre-conditioned a minimum of 24 hours in ambient temperatures similar to the prevailing operational conditions.

E. Store panels in temperature-controlled environments. Leave protective blue film on panel until ready to use.

1.08 WASTE MANAGEMENT AND DISPOSAL

A. Deposit all packaging materials in an appropriate container on site for recycling or reuse.

B. Avoid using landfill waste disposal procedures when recycling facilities are available.

C. Keep all discarded packaging away from children.

1.09 PROJECT CONDITIONS

A. Temperature Requirements: If storage temperature is below 68F (20C), the Altro Tegulis wall panel must be moved to a warmer place and allowed to reach this temperature

before installation. For further information, refer to current Installation Guide.

B. Maintain air temperature and structural base temperature at installation area between 68F (20C) and 80F (27C) for 48 hours before, during and 24 hours after installation.

1.10 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

C. Warranty Period for Altro Tegulis shall be 5 years commencing on Date of Substantial Completion, warranty available online at www.altrofloors.com.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Altro

1. USA: 80 Industrial Way, Wilmington, MA 01887
Toll-free: 800.377.5597 Fax: 978.694.0433
E-mail: support@altrofloors.com Web Site: www.altrofloors.com.

2.02 HYGIENIC WALL COVERINGS

A. Altro Tegulis is homogeneous, 100% pure vinyl, extruded, semi-rigid PVCu sheet, no plasticizers or fillers.

Acceptable material: Altro Tegulis (measurements and product weights are approximate): Thickness: 0.10" (2.5 mm); Panel Width: 4' (1.22m) Panel Height: Either 8'2" or 9' 10.25" (2.5m or 3m); Weight 4'x 8'2" Panel: 24 lbs (10.7 kg); Weight 4'x 9'10.25" Panel: 28 lbs (12.8 kg).

SELECT:

1. **PANEL SIZE:** 4' wide x 8'2" (2.5 m) high
2. **PATTERN VISUAL:** SUBWAY TILE - 3" x 6"
3. **PANEL COLOR:** White (Standard)
4. **INSTALLATION METHOD:** HALF-LAP (wet and dry areas)

2.03 ACCESSORIES

Including but not limited to:

A. **Joint Strips:** 2-Part Joint Strip (8' or 10') – to match panel color

B. **Cut-Tile Transition Strip**: 1-**Part Transition Strip – [G832/25 White only*]** Length 98.5"

C. **Start and Edge Trims: G833** 1-Part [8'/10' **White Only**], **A833** 2-Part [8'/10]'- to match panel color

D. **A839/30 Inside Corner Trim:** 1-part trim - 10' lengths – to match panel color where applicable

E. **Adhesives**: Altro AP600, Altro W39, or Altro W157 as recommended by Altro. **Parabond AP 600 is not recommended for use on existing tile substrates. Adhesive selection and trowel notch is determined by substrate and environmental conditions of the application. Refer to Tegulis Installation Guide for appropriate recommendation.**

F. **Sanitary Sealant Compounds and Tape Adhesion Promoter:**

.1 Altro Sanitary Sealant – [A806/** color) 10.5 oz Tube

.2 Altro W1650.5 Tape Adhesion Promoter – ½ US Gallon

2.04 SOURCE QUALITY

A. Source Quality: Obtain wall products from a single manufacturer.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog, installation instructions and product label instructions for installation.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.03 SUBSTRATE PREPARATION

A. Walls should be smooth and level. High points must be removed and low points filled with filler intended for the substrate and environmental conditions.

B. Wall tiles must be fixed firmly to the wall. As long as the tile edges do not protrude, you do not have to skim grout joints.

C. Surfaces must be permanently dry and free from all substances that may contribute to adhesive bond failure.

D. Remove loose paint and conduct an adhesive bond test with paint.

E. Exterior walls must be adequately damp-proofed and insulated.

F. Dry wall substrates should be paint ready.

3.04 PREPARATION

A. All surfaces must be free from dust and cleaned prior to Altro Tegulis installation. The working environment must also be dust free. Failure to comply with these conditions will reduce the bond strength between the adhesive and substrate, and may cause the Altro Tegulis panels to debond.

B. Very absorbent / porous substrates (particularly plaster finishes and unprimed sheetrock) must have a proprietary sealer e.g. PVA primer or similar, applied to the surface a minimum of 12 hours prior to the installation.

C. All electrical switches, power points etc., should be in a first fix / installation state. All electrical equipment should only be moved or altered by a qualified electrician.

D. All plumbing should have pipe-work removed to a first fix or installation state and "tails" left protruding from the substrate. Altro Tegulis panels can then be drilled and slid over the pipe tails. All holes should be drilled 1/8" (3mm) oversize to allow for expansion, then sealed with Altro Sanitary Sealant. Plumbing should always be done by a qualified plumber.

E. Hot pipes and steam pipes should be insulated and a 1/8" to 1/4" (3-6mm) expansion gap should be created when installing panels around these pipes, then sealed with Altro Sanitary Sealant.

F. All pipes, fixing bolts, etc. extending through the Altro Tegulis panels should have a minimum 1/8" (3mm) expansion gap and be sealed using Altro Sanitary Sealant.

G. If fitting to doorframes, these must be in place prior to installation of Altro Tegulis.

H. Prior to installation, it is advisable to complete any painting which comes in contact with

Altro Tegulis, as sealant used at junctions is non-paintable.

I. Panels should be stored flat and be pre-conditioned a minimum of 24 hours in ambient temperatures similar to prevailing operational conditions.

J. The panels must be stored on a level flat surface off the ground (risk of condensation on the panels if stored on damp surfaces). Storage on uneven surfaces could cause the panels to distort prior to installation.

K. First, check the room using a 6' (2 m) level to ensure all walls are flat, paying particular attention to the corners, window reveals, and door entrances. These need to be inspected to ensure they are free of any debris or irregularities, which could prevent the panels laying flat to the substrate after the adhesive has been applied and the panel installed.

3.05 INSTALLATION

A. Hygienic Wall Installation: Install Altro Tegulis in accordance with the current published Installation Guide. All joints should be joined by approved methods as detailed in the installation guide. Failure to install Altro Tegulis in accordance with recommended procedures will void the Altro Limited Product Warranty.

3.06 CLEANING

Note: Once all panels and joints are installed, remove protective film and clean all surfaces down with antistatic solution or antistatic wipes. This is required as the panel may have static build up and any dust in the atmosphere will adhere to the surface of the panel.

A. Altro Tegulis can be cleaned with a diluted soap/detergent solution, such as Altro 44 Cleaner.

B. When cleaning the Altro Tegulis surface, we recommend the temperature of water does not exceed 140° F (60° C).

C. Use cleaning materials compliant with USP regulations, including synthetic, non-shedding mops and specified chemical solutions. Manual unidirectional strokes are recommended to avoid spreading contaminants during cleaning process. Sanitized water is also necessary to thoroughly rinse surfaces.

D. To reduce the buildup of static, cleaning the panels with an anti-static solution is recommended.

E. Stubborn stains use AltroClean 44 cleaner or equivalent alkaline cleaner.

Specifier Note: If a construction waste separation and disposal workplan is incorporated as part of the project, ensure that this section makes reference to how the excess material can be recycled or otherwise disposed of. Avoid sending construction waste to landfill sites if alternative means of disposal are available.

F. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 099000
PAINTING AND COATINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interior paint and coatings systems including surface preparation.

B. Exterior paint and coatings systems including surface preparation.

1.2 RELATED SECTIONS

A. Section 033000 – Cast-in Place Concrete: Surface coordination and curing provisions.

B. Section 051000 - Structural Steel: Shop priming structural steel.

C. Section 055000 - Metal Fabrications: Shop priming ferrous metal.

D. Section 062023 – Finish Carpentry

E. Section 081113 – Hollow Metal Doors and Frames: Factory priming steel doors and frames.

F. Section 092900 - Gypsum Board Assemblies: Surface preparation of gypsum board.

1.3 REFERENCES

A. Steel Structures Painting Council (SSPC):
   1. SSPC-SP 1 - Solvent Cleaning.
   2. SSPC-SP 2 - Hand Tool Cleaning.
   3. SSPC-SP 3 - Power Tool Cleaning.
   4. SSPC-SP5/NACE No. 1, White Metal Blast Cleaning.
   5. SSPC-SP6/NACE No. 3, Commercial Blast Cleaning.
   6. SSPC-SP7/NACE No. 4, Brush-Off Blast Cleaning.
   7. SSPC-SP10/NACE No. 2, Near-White Blast Cleaning.
   8. SSPC-SP11, Power Tool Cleaning to Bare Metal.
   9. SSPC-SP12/NACE No. 5, Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating.
   10. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

B. Material Safety Data Sheets / Environmental Data Sheets: Per manufacturerís MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

C. South Coast Air Quality Management District (SCAQMD): Rule 1113 - Architectural Coatings.

D. Green Seal, Inc.:
   1. GS-11 Standard for Paints and Coatings.(1st Edition, May 20,1993)
   2. GC-03 - Environmental Criteria for Anti-Corrosive Paints.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: For each paint system indicated, including.
   1. Product characteristics.
   2. Surface preparation instructions and recommendations.
   3. Primer requirements and finish specification.
   4. Storage and handling requirements and recommendations.
   5. Application methods.
   6. Cautions for storage, handling and installation.

C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors and sheens available.

D. Only submit complying products based on project requirements. One must also comply with the regulations regarding VOCs (CARB, OTC, SCAQMD, LADCO). To ensure compliance with district regulations and other rules, businesses that perform coating activities should contact the local district in each area where the coating will be used.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Architect will select from standard products, colors and sheens available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels unless indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information.
1. Product name, and type (description).
2. Application and use instructions.
3. Surface preparation.
4. VOC content.
5. Environmental handling.
6. Batch date.
7. Color number.

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.7 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.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional one percent of each material and color, but not less than 1 gal (3.8 l) or 1 case, as appropriate.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Sherwin-Williams, which is located at: 101 Prospect Ave. ; Cleveland, OH 44115; Toll Free Tel: 800-524-5979; Tel: 216-566-2000; Fax: 440-826-1989; Email: request info (sherwin@ultlead.com); Web: www.sherwin-williams.com/pro/services/architects_designers/?WT.mc_id=SWRedirect_ProServices_Architects

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 APPLICATIONS/SCOPE

A. Interior Paints and Coatings
1. Concrete: Poured, cast-in-place.
2. Plaster Systems: Plaster and Acoustical Plaster.
3. Masonry: Concrete masonry units, including split-face, scored, and smooth block.
4. Metal: Aluminum, galvanized steel.
5. Metal: Structural steel, joists, trusses, beams, partitions and similar items.
6. Wood: Walls, ceilings, doors, trim and similar items.
7. Drywall: Drywall board, Gypsum board.

2.3 PAINT MATERIALS - GENERAL

A. Paints and Coatings.
1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.

B. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

C. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

D. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

E. VOC Classification: Provide high-performance coating materials, including primers, undercoats, and finish-coat materials, that meet the applicable local, state or federal VOC requirements.

F. Color: Refer to Finish Schedule for paint colors, and as selected by Architect.

2.4 INTERIOR & EXTERIOR PAINT SYSTEMS

A. PLASTER SYSTEMS - (Walls, Ceilings).
1. Latex Systems:
a. Semi-Gloss Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series (4 mils wet, 1.6 mils dry per coat).
b. Egg-Shell / Satin Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8

mils wet, 3.2 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.7 mils dry per coat).

c. Flat Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.6 mils dry per coat).

B. MASONRY: CMU - Concrete, Split Face, Scored, Smooth, High Density, Low Density, Fluted.

1. Latex Systems:

a. Semi-Gloss Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series (4 mils wet, 1.6 mils dry per coat).

b. Egg-Shell / Satin Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.7 mils dry per coat).

c. Flat Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.6 mils dry per coat).

2. Elastomeric Systems: **(Exterior for windows – Match existing exterior finish):**
1) 1st Coat: S-W Loxon Concrete and Masonry Primer
2) 2nd Coat: S-W Conflex XL Smooth High build Coating – Medium

C. METAL: Aluminum, Galvanized.

1. Latex Systems:

a. Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Latex Gloss Enamel, B21-2200 Series.
3) 3rd Coat: S-W ProMar 200 Latex Gloss Enamel, B21-2200 Series (4.0 mils wet, 1.5 mils dry per coat).

b. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series (4.0 mils wet, 1.6 mils dry per coat).

c. Egg-Shell / Satin Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.7 mils dry per coat).

d. Flat Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5.0 mils wet, 2.0 mils dry).

2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.6 mils dry per coat).

D. METAL: Galvanized; Ceilings, Duct work.
1. Multi-Surface Acrylic Coating System:
2. Dryfall Waterborne Topcoats:
a. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (5.8 mils wet, 2.3 mils dry per coat).
b. Egg-Shell Finish:
1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series.
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (6.0 mils wet, 1.9 mils dry per coat).
c. Flat Finish:
1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series.
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (6.0 mils wet, 1.7 mils dry per coat).

E. METAL - (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous and Ornamental Iron, Structural Iron, Ferrous Metal)
1. Urethane System (Water Base):
a. Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Waterbased Acrolon 100, B65-720 Series.
3) 3rd Coat: S-W Waterbased Acrolon 100, B65-720 Series (4.0 mils wet, 2 mils dry per coat).

F. WOOD - (Walls, Ceilings, Doors, Trim):
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: S-W Premium Wall and Wood Primer, B28W8111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W ProClassic Waterborne Acrylic Gloss, B21-51 Series.
3) 3rd Coat: S-W ProClassic Waterborne Acrylic Gloss, B21-51 Series (4 mils wet, 1.5 mils dry per coat).
b. Semi - Gloss Finish:
1) 1st Coat: S-W Premium Wall and Wood Primer, B28W8111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series.
3) 3rd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series (4 mils wet, 1.3 mils dry per coat).
c. Eg-Shel / Satin Finish:
1) 1st Coat: S-W Premium Wall and Wood Primer, B28W8111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W ProClassic Waterborne Acrylic Satin, B20 Series.
3) 3rd Coat: S-W ProClassic Waterborne Acrylic Satin, B20 Series (4 mils wet, 1.2 mils dry per coat).
d. Flat Finish:
1) 1st Coat: S-W Premium Wall and Wood Primer, B28W8111 (4 mils wet, 1.8 mils dry)
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.6 mils dry per coat).

G. DRYWALL - (Walls, Ceilings, Gypsum Board and similar items)
1. Latex Systems:
a. Semi-Gloss Finish:

1) 1st Coat: S-W ProMar200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series (4 mils wet, 1.6 mils dry per coat).

b. Egg-Shell / Satin Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.7 mils dry per coat).

c. Flat Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.6 mils dry per coat).

H. METAL: Aluminum, Galvanized.
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: S-W A-100 Exterior Latex Gloss, A8 Series.
2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8 Series (4 mils wet, 1.3 mils dry per coat).

b. Gloss Finish - Early Moisture Resistant Finish:
1) 1st Coat: S-W Resilience Latex Gloss, K44 Series.
2) 2nd Coat: S-W Resilience Latex Gloss, K44 Series (4 mils wet, 1.6 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series.
2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4 mils wet, 1.5 mils dry per coat).

d. Satin Finish:
1) 1st Coat: S-W A-100 Exterior Latex Satin, A82 Series.
2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4 mils wet, 1.5 mils dry per coat).

e. Satin Finish - Early Moisture Resistant Finish:
1) 1st Coat: S-W Resilience Latex Satin, K43 Series.
2) 2nd Coat: S-W Resilience Latex Satin, K43 Series (4 mils wet, 1.52 mils dry per coat).

f. Flat Finish:
1) 1st Coat: S-W A-100 Exterior Latex Flat, A6 Series.
2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4 mils wet, 1.2 mils dry per coat).

g. Flat Finish - Early Moisture Resistant Finish:
1) 1st Coat: S-W Resilience Latex Flat, K42 Series.
2) 2nd Coat: S-W Resilience Latex Flat, K42 Series (4 mils wet, 1.56 mils dry per coat).

I. METAL: Misc. Iron, Ornamental Iron, Structural Iron and Steel, Ferrous Metal.
1. Semigloss Finish: One finish coat over an intermediate coat and a primer.
a. Primer: Epoxy primer.
1) PPG; 95-245 Series Pitt-Guard Rapid Coat DTR Polyamide Epoxy Coating.

b. Intermediate Coat: Aliphatic polyurethane enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 2.0 to 5.0 mils
1) PPG; 95-8800 Series Pitthane High Build Semi-Gloss Urethane Enamel.

c. Topcoat: Aliphatic polyurethane enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 2.0 to 5.0 mils

1) PPG; 95-8800 Series Pitthane High Build Semi-Gloss Urethane Enamel.

J. WOOD: Siding, Trim, Shutters, Sashes, Hardboard-Bare/Primed.
1. Stain - Water Reducible Systems:
a. Semi-Transparent:
1) 1st Coat: S-W WoodScapes Polyurethane Stain, A15T5.
2) 2nd Coat: S-W WoodScapes Polyurethane Stain, A15T5 (100-350 sq ft/gal).
b. Solid Color:
1) 1st Coat: S-W WoodScapes Solid Color Stain, A15 Series.
2) 2nd Coat: S-W WoodScapes Solid Color Stain, A15 Series (200-400 sq ft/gal).

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

C. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify Architect immediately if lead based paints are encountered.

3.2 SURFACE PREPARATION

A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.
1. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry a minimum of 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.
2. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
3. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.

B. Aluminum: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

C. Block (Cinder and Concrete): Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75 degrees F (24 degrees C). The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.

D. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all

types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

E. Cement Composition Siding/Panels: Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments.

F. Copper and Stainless Steel: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP 2, Hand Tool Cleaning.

G. Exterior Composition Board (Hardboard): Some composition boards may exude a waxy material that must be removed with a solvent prior to coating. Whether factory primed or unprimed, exterior composition board siding (hardboard) must be cleaned thoroughly and primed with an alkyd primer.

H. Drywall - Exterior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting. Exterior surfaces must be spackled with exterior grade compounds.

I. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.

J. Galvanized Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.

K. Plaster: Must be allowed to dry thoroughly for at least 30 days before painting, unless the products are designed to be used in high pH environments. Room must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1 gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry.

L. Steel: Structural, Plate, And Similar Items: Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow.
   1. Solvent Cleaning, SSPC-SP1: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
   2. Hand Tool Cleaning, SSPC-SP2: Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
   3. Power Tool Cleaning, SSPC-SP3: Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove

visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.

4. White Metal Blast Cleaning, SSPC-SP5 or NACE 1: A White Metal Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
5. Commercial Blast Cleaning, SSPC-SP6 or NACE 3: A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
6. Brush-Off Blast Cleaning, SSPC-SP7 or NACE 4: A Brush-Off Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust, and paint may remain on the surface. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods.
7. Power Tool Cleaning to Bare Metal, SSPC-SP11: Metallic surfaces that are prepared according to this specification, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible deposits of oil or grease by any of the methods specified in SSPC-SP1, Solvent Cleaning, or other agreed upon methods.
8. Near-White Blast Cleaning, SSPC-SP10 or NACE 2: A Near White Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 5 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
9. High- and Ultra-High Pressure Water Jetting for Steel and Other Hard Materials: SSPC-SP12 or NACE 5: This standard provides requirements for the use of high- and ultra-high pressure water jetting to achieve various degrees of surface cleanliness. This standard is limited in scope to the use of water only without the addition of solid particles in the stream.
10. Water Blasting, SSPC-SP12/NACE No. 5: Removal of oil grease dirt, loose rust, loose mill scale, and loose paint by water at pressures of 2,000 to 2,500 psi at a flow of 4 to 14 gallons per minute.

M. Vinyl Siding, Architectural Plastics, EIFS and Fiberglass: Clean vinyl siding thoroughly by scrubbing with a warm, soapy water solution. Rinse thoroughly. Do not paint vinyl siding with any color darker than the original color, unless the paint system features Sherwin-Williams VinylSafe technology. Painting with darker colors that are not Sherwin-Williams VinylSafe may cause siding to warp

N. Stucco: Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments such as Loxon.

O. Wood: Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

3.3 INSTALLATION

A. Apply all coatings and materials with the manufacturerís specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

B. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

C. Apply coatings using methods recommended by manufacturer.

D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

F. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

3.4 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION

SECTION 099410
Architectural Finish Films

PART 1 - GENERAL

1.1 SUMMARY

A. 3M™ DI-NOC™ Architectural Finishes
B. Related Sections
1. Section 06 20 00 – Finish Carpentry
2. Section 06 40 00 – Architectural Woodwork
3. Section 09 29 00 – Gypsum Board: Gypsum wallboard back-up
4. Section 12 30 00 – Manufactured Casework

1.2 SUBMITTALS

A. Manufacturer's Product Data for specified products.
B. Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.
C. Samples: 4 inch by 4 inch Samples of specified color and pattern for verification.
D. Mockups: as required.
E. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.
F. LEED requirements: Refer to Section 01-8112 and Section 01-8113 for information regarding VOC limits, recycled content, regional materials, and required documentation.

1.3 QUALITY ASSURANCE

A. Obtain all products in this section from a single supplier.
B. Installer: Installation shall be performed by a trained and qualified installer, specialized and experienced in work required for this project. A list of 3M Endorsed installers is available at 3M.com/AMD or 3M Commercial Solutions, 1-888-650-3497.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
B. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
C. Product must remain in original plastic bag and boxes and have storage conditions as follows:
1. 40 °F – 90 °F (4 °C – 32 °C)
2. Out of direct sunlight
3. Clean dry area
4. Original container
5. Do not stack boxes over six (6) units high. Excessive weight can damage the film
6. Relative humidity below 80 percent
7. Handle products in accordance with manufacturer's instructions.
8. Total pre-installation shelf life: 2 years. Up to 2 years unprocessed, OR process within 1 year *and* apply within 1 year of processing.

1.5 PROJECT/SITE CONDITIONS

A. Confirm appropriate substrate is suitable for mounting of architectural finish components prior to start of installation.
B. Apply materials when environmental conditions are continuously heated. Application temperature range is 60 □F - 100 □F (16 □C - 38 □C).
C. Environmental Limitations: Do not install until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and

humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.6 WARRANTY

A. Manufacturer's Warranty: Submit manufacturer's standard warranty document by authorized manufacturer.
B. Standard Product Warranty: See the *3M™ DI-NOC™ Technical Data Sheet*.

1.7 EXTRA MATERIALS

A. Furnish 2 percent extra material at time of installation. Deliver in protective packaging for storage and label contents appropriately.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. 3M Company - Commercial Solutions Division [CSD]
3M Center, Building 0220-12-E-04
St. Paul, MN 55144-1000, USA
1-888-650-3497

B. Material Standard: Design based upon 3M™ DI-NOC™ Architectural Finishes with pressure-sensitive adhesive and air release channels.

C. Basis of Design: DI-NOC™ Architectural Finishes material. Quickship 3 DW-1874MT (Wood Grain to match PL-1)

2.2 MATERIAL PROPERTIES

A. General: [Wood grain] appearance and texture graphic film field applied application.
B. Film: Vinyl 8 mil (200 microns) thickness (thickness includes film and adhesive, excludes liner).
Note: Please verify materials in each pattern of DI-NOC™ specified.
C. Liner: Silicone-coated poly paper, 6.2 mils (157 microns).
D. Adhesive: Pressure-sensitive with air release channels, recommended by manufacturer.
E. Fire-Test-Response Characteristics: Most patterns of 3M™ DI-NOC™ finishes have the following fire-test-response characteristics as determined by testing Products applied to substrates per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
Note: Please verify fire rating for each pattern of DI-NOC™ specified.
1. Surface-Burning Characteristics: As follows, per ASTM E84:
    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 450 or less.
F. Abrasion Resistance Taber® Abraser Abrasion wheel
    1. CS-17 Abrasion Wheel: 1kg loading weight, 7,000 cycles with no wear-through of surface finish.
G. Chemical and stain resistance: Contaminant was in contact with the film surface for 24 hours and then removed using water or mild detergent. Results may vary. The following contaminants were tested: Coffee, Tea, Cola, Milk, Red Wine, Ketchup, Soy Sauce, Cooking Oil, Vinegar, Mustard, Crayon, Shoe Polish (a little stain remained), Betadine Iodine, Soap Solution (1%), Ammonia solution (10%), Citrate solution (10%), Ethyl Alcohol (50%).
H. Application: recovering laminate panels in elevator.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate(s) for compliance with requirements for non-porous, smooth surface and other conditions affecting the performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Reference *3M™ DI-NOC™ Technical Data Sheet* and *3M™ DI-NOC™ Installation Guide* to determine compatibility of finish to substrate.
C. Do not proceed with installation until unsatisfactory conditions have been corrected.
D. Responsibility for state of surfaces prior to installation to be pre-determined by installation specialist.
E. Scheduling of installation by Owner or its representative implies that substrate and conditions are prepared and ready for product installation per the recommendations of the installation specialist.
F. Proceeding with installation implies the installer's acceptance of substrate and conditions.

3.2 SURFACE PREPARATION

A. Comply with all manufacturers' instructions for surface preparation. Consider these factors in determining the suitability of the Product:
1. Substrate texture affects Product adhesion and application ease.
    a. Unless the substrate is very smooth, its texture may be visible through Product.
    b. Compounds used to smooth a textured substrate permanently change that substrate.
    c. Product removal may damage the substrate or its finish.
2. Application surface conditions affect Product adhesion.
    a. Ensure that the existing paint, surface finish, or wall covering has excellent bond to the substrate area where Product will be applied.
    b. Repair, prime and paint the substrate, as needed.
    c. An adhesion promoter may be required to increase Product adhesion.
3. Human and environmental conditions affect Product.
    a. Temperature and humidity in the recommended range.
    b. Direct UV light (sunlight).
    c. Heating or cooling ducts in close proximity.
    d. Unsealed substrates in front of water sources.
    e. People or equipment that will be in contact with the Product.
4. The Product may contain a splice. The location of the splices is marked with a tab along the edge of the Product. The installer will need to determine the impact of the splice and work around it to make the best use of the material layout.
B. Test and prepare application surfaces per instructions in the *3M™ DI-NOC™ Installation Guide.*
1. Use the 3M™ Wall Adhesion Test to determine the compatibility of the application surface with the Product.
2. Use the 3M™ Enhanced Cleaning Method to ensure that the application surface is ready to receive and hold the Product.
C. Repair damaged application surfaces per instructions in the *3M™ DI-NOC™ Installation Guide*
D. Re-clean application surfaces with a lint-free cloth and 70/30 IPA cleaning solution, or use the 3M™ Enhanced Cleaning Method in the *3M™ DI-NOC™ Installation Guide*.

3.3 APPLICATION

A. Refer to the *3M™ DI-NOC™ Installation Guide* for specific application instructions.
B. Application must be performed by a qualified installer. Refer to 3M.com/AMD for a list of 3M-endorsed installers.
C. Do not proceed with installation until all finishing work has been completed in and around the work area.
D. Measure the application surface and cut film to size with a minimum ½ in. extra on all sides for trimming.
E. Install substrates with no gaps, wire seams, or overlaps. Form smooth, wrinkle-free, bubble-free surface for finished installation.
F. No exposed joints on corners or other "open" type joints permitted.
G. Verify pattern prior to material acquisition as some part numbers do not allow three-dimensional forming.
H. Comply with manufacturer's installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
I. Apply 3M™ DI-NOC™ over properly prepared substrates.
J. Remove air bubbles, wrinkles, and blisters. Use approved procedures to prevent the formation of air bubbles, wrinkles, blisters and other defects.

3.4 CLEANING AND PROTECTION

A. Use cleaning methods recommended by architectural surfacing manufacturer for applicable environment.
B. Protect completed graphic film during remainder of construction period.
C. Consult with authorized installation specialist for project specifics.

END OF SECTION

SECTION 101100
VISUAL DISPLAY BOARDS & EQUIPMENT

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

1. Tackboards

QUALITY ASSURANCE:

Manufacturer: Furnish all markerboards and tackboards by a single manufacturer for the entire project.

SUBMITTALS:

Shop Drawings: Submit shop drawings for each type of tackboard. Include sections of typical trim members and dimensioned elevations. Show gauges, profiles, sections of materials, anchors, grounds, reinforcement, accessories, layout, installation details, etc., all as applicable for specified materials.

Product Data: Submit manufacturer's technical data, product specifications, and installation instructions for each material and component part, including data substantiating that materials comply with requirements.

Samples: Submit full range of color samples for each type of markerboard, tackboard, trim and accessory required. Provide 12" square samples of sheet materials and 12" lengths of trim members for color verification after selections have been made.

Certification: Workmanship and materials shall meet requirements and recommendations of applicable portions or standards listed.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS:

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

Manufacturers of Tackboard

Claridge Products & Equipment, Inc.
Greensteel Inc. (*Guide specification)
ADP Lemco

MATERIALS:

Plastic Impregnated Cork Tackboards: Provide seamless sheet, 1/4" thick ground natural cork compressed with a resinous binder with washable vinyl finish and integral color throughout, laminated to burlap backing. Provide color and texture as scheduled or as selected from the manufacturer's standards.

Backing: Make panels rigid by factory laminating cork face sheet under pressure to 1/4" thick fiberboard backing.

Metal Trim and Accessories: Fabricate markerboard and tackboard frames and trim of not less than 0.062" thick aluminum alloy, size and shape comparable to **Greensteel's AL Series**. Provide straight, single length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure. Trim to be factory assembled and installed.

Where the size of boards or other conditions exist which require support in addition to the normal trim, provide structural supports or modify the trim as indicated, or as selected by the Architect from the manufacturer's standard structural support accessories to suit the condition indicated.

Clear Anodized Finish: Furnish exposed aluminum trim, accessories and fasteners with the manufacturer's standard satin anodized finish with clear anodic coating complying with AA requirements for Class II Architectural Coating (AA-A31).

PART 3 - EXECUTION

PREPARATION:

Field Measurements: Take field measurements prior to the preparation of shop drawings and fabrication where possible, to ensure proper fitting of the work. Allow for trimming and fitting wherever taking of field measurements before fabrication might delay work.

INSTALLATION:

Deliver factory-built tackboard completely assembled in one piece without joints, whenever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

Install units in locations and mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide all grounds, clips, backing materials, adhesives, brackets, anchors, trim and accessories necessary for a complete installation.

Anchor all components securely using tamperproof fasteners, where accessible or with completely concealed continuous hangers. Coordinate job-site assembled units with grounds, trim, and accessories. Join all parts with a neat precision fit.

ADJUST AND CLEAN:

Verify that accessories required for each unit have been properly installed and that operating units function properly.

Clean units in accordance with the manufacturer's instructions. Break-in markerboards only as recommended by the manufacturer.

VISUAL DISPLAY BOARD & EQUIPMENT SCHEDULE:

SPACE	ROOM NUMBER	TACK BD.
CORR.	102	Qty. (2) 4’x6’
CORR	104	Qty. (1) 4’ x 8’
Typical for all apartment floor elevator vestibules		Qty. (1) 4’ x 8’ typical

END OF SECTION

SECTION 102113
SOLID PLASTIC TOILET PARTITIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid plastic toilet compartments and urinal screens.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. ASTM International (ASTM):
   1. A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   2. B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   3. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. National Fire Protection Association (NFPA) 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.3 SYSTEM DESCRIPTION

A. Compartment Configurations:
   1. Toilet partitions: Floor Mounted/Braced.
   2. Urinal screens: Wall mounted.

1.4 SUBMITTALS

A. Submittals for Review:
   1. Shop Drawings: Include dimensioned layout, elevations, trim, closures, and accessories.
   2. Product Data: Manufacturer's descriptive data for panels, hardware, and accessories.
   3. Samples: Manufacturer’s standard samples showing available colors.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 years experience in manufacture of solid plastic toilet compartments with products in satisfactory use under similar service conditions.

B. Installer Qualifications: Minimum 5 years experience in work of this Section.

1.6 WARRANTIES

A. Provide manufacturer’s 25 year warranty against breakage, corrosion, and delamination under normal conditions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Solid Plastic Products by Scranton Products. (www.scrantonproducts.com)
   Finish: Rotary Brushed
   Color: Nickle

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Doors, Panels and Pilasters:
   1. High density polyethylene (HDPE), fabricated from polymer resins compounded under high pressure, forming single thickness panel.
   2. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
   3. 1 inch thick with edges rounded to 1/4 inch radius.
   4. Fire hazard classification: Pass NFPA 286.
   5. Color: To be selected by Architect from manufacturer's full color range.

B. Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.

C. Stainless Steel: ASTM A167, Type 304.

2.3 HARDWARE

A. Hinges:
   1. 8 inches long, fabricated from heavy-duty extruded aluminum with bright dip anodized finish, wrap-around flanges, adjustable on 30-degree increments, through bolted to doors and pilasters with stainless steel, Torx head sex bolts.
   2. Hinges operate on field-adjustable nylon cams, field adjustable in 30 degree increments.

B. Door Strike and Keeper:
   1. 6 inches long, fabricate from heavy-duty extruded aluminum with bright dip anodized finish, with wrap-around flanges secured to pilasters with stainless steel tamper resistant Torx head sex bolts.
   2. Bumper: Extruded black vinyl.

C. Latch and Housing:
   1. Heavy-duty extruded aluminum.
   2. Latch housing: Bright dip anodized finish.
   3. Slide bolt and button: Black anodized finish.

D. Coat Hook/Bumper:
   1. Combination type, chrome plated Zamak.
   2. Equip outswing handicapped doors with second door pull and door stop.

E. Door Pulls: Chrome plated Zamak.

2.4 COMPONENTS

A. Doors and Dividing Panels: 55 inches high, mounted 14 inches above finished floor, with aluminum heat-sinc fastened to bottom edges.

B. Pilasters: Mounted 14 inches above floor, secured to ceiling supports with manufacturer's standard hardware, fastened to pilaster sleeves with stainless steel tamper resistant Torx head sex bolt, with stainless steel angle attachment to floor and ceiling.

C. Pilaster Sleeves: 4 inches high, 20 gage stainless steel, secured to pilaster with stainless steel tamper resistant Torx head sex bolt.

D. Wall Brackets: 54 and 68 inches long, heavy-duty aluminum, bright dip anodized finish, fastened to pilasters and panels with stainless steel tamper resistant Torx head sex bolts.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install compartments in accordance with manufacturer's instructions and approved Shop Drawings.

B. Install rigid, straight, plumb, and level.

C. Locate bottom edge of doors and panels 14 inches above finished floor.

D. Provide uniform, maximum 3/8 inch vertical clearance at doors.

E. Not Acceptable: Evidence of cutting, drilling, or patching.

3.2 ADJUSTING

A. Adjust doors and latches to operate correctly.

END OF SECTION

SECTION 102600
Rigid Vinyl Sheet Wall Protection

PART 1 - GENERAL

1.01 SUMMARY

A. Palladium® Rigid Vinyl Sheet for wall protection and decoration

1.02 SECTION INCLUDES

A. Palladium® Rigid Vinyl Sheet

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)
B. National Building Code of Canada (NBC)
C. National Fire Protection Association (NFPA)
D. Society of Automotive Engineers (SAE)
E. Underwriters Laboratory (UL)
F. Underwriters Laboratory of Canada (ULC)
G. Uniform Building Code (UBC)

1.04 SYSTEM DESCRIPTION

A. Performance Requirements: Provide Palladium® Rigid Vinyl Sheet systems that conform to the following requirements of regulatory agencies and the quality control of IPC Door and Wall Protection Systems™, InPro Corporation.

1. Fire Performance Characteristics: Provide UL Classified Palladium® Rigid Vinyl Sheet conforming with the NFPA Class A fire rating. Surface burning characteristics as determined by UL-723 (ASTM E-84), for Palladium® Rigid Vinyl Sheet installed with 3M Fastbond 30, InPro Bond Adhesive, or Formulated Solutions, LLC “XT-2000+" Adhesive shall be a maximum flame spread of 20 and a maximum smoke developed of 350 for .060" (1.5mm) thick material. Provide ULC (Canada) listed Palladium® Rigid Vinyl Sheet conforming to the requirements of the National Building Code of Canada 2010, Subsection 3.1.13. Surface burning characteristics, as determined by CAN/ULC-S102.2, shall be flame spread of 15 and smoke developed of 30.
2. Self Extinguishing: Provide Palladium® Rigid Vinyl Sheet with a CC1 classification, as tested in accordance with the procedures specified in ASTM D-635-74, Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position, as referenced in UBC 52-4-1988.
3. Provide sheet materials that have been tested and results filed in compliance with article 15, part 1120 of the New York State uniform fire prevention and building code. DOS # 09960-930.504.4001.
4. Impact Strength: Provide Palladium® Rigid Vinyl Sheet that has an Impact Strength of 30.4 ft-lbs/ inch of thickness as tested in accordance with the procedures specified in ASTM D-256-90b, Impact Resistance of Plastics.
5. Chemical and Stain Resistance: Provide Palladium® Rigid Vinyl Sheet that shows resistance to stain when tested in accordance with applicable provisions of ASTM D-543.
6. GREENGUARD Certified: Provide GREENGUARD Certified material. Profiles shall meet the requirements of GREENGUARD Certification Standards for Low-Emitting Products and GREENGUARD Product Emission Standard for Children & Schools.
7. Fungal and Bacterial Resistance: Provide Palladium® Rigid Vinyl Sheet that does not support fungal or bacterial growth as tested in accordance with ASTM G-21 and ASTM G-22.
8. Color Consistency: Provide components matched in accordance with SAE J-1545 - (Delta E) with a color difference no greater than 1.0 units using CIE Lab, CIE CMC, CIE LCh, Hunter Lab or similar color space scale systems.

1.05 SUBMITTALS

A. Product Data: Manufacturer's printed product data for each type of Palladium® Rigid Vinyl Sheet specified.

B. Detail Drawings: Mounting details with the appropriate adhesives for specific project substrates.
C. Samples: Verification samples of Palladium® Rigid Vinyl Sheet, 8” (203mm) square of each type and color indicated.
D. Manufacturer's Installation Instruction: Printed installation instructions for Palladium® Rigid Vinyl Sheet.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened factory packaging to the jobsite
B. Inspect materials at delivery to ensure that specified products have been received.
C. Store in original packaging in a climate-controlled location away from direct sunlight.

1.07 PROJECT CONDITIONS

A. Environmental Requirements: Products must be installed in an interior climate-controlled environment.

1.08 WARRANTY

A. Standard IPC Limited Lifetime Warranty against material and manufacturing defects.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturer: IPC Door and Wall Protection Systems, InPro Corporation, PO Box 406 Muskego, WI 53150 USA; Telephone: 800.222.5556, Fax: 888.715.8407, www.inprocorp.com
B. Substitutions: Not permitted
C. Provide all Palladium® Rigid Vinyl Sheet and wall protection from a single source.

2.02 MANUFACTURED UNITS

A. Rigid Vinyl Sheet
1. Palladium® Rigid Vinyl Sheet

Wall Protection WC-2
Item # Palladium Patterns Woven Mint WVN-01
Dimensions Thickness 405 - 4'x8' (1.22m x 2.44m) .040" = 3/64" (1mm), standard
Custom sizes - available
Backing - unbacked

Wall Protection WC-3
Item # Palladium Rigid Sheet Seagrass 0230
Dimensions Thickness 405 - 4'x8' (1.22m x 2.44m) .040" = 3/64" (1mm), standard

2. Accessories:
A.Vinyl (All Accessories in Color: Seagrass 0230)
407 Top Cap; Length: 8' (2.44m) standard, 10' (3.04m) available
408 Vertical Divider Bar; Length: 8' (2.44m) standard, 10' (3.04m) available
409 Inside Corner; Length: 8' (2.44m) standard, 10' (3.04m) available
417 Top Cap for .080" sheet; Length: 8' (2.44m) standard, 10' (3.04m) available
418 Vertical Divider Bar for .080" sheet; Length: 8' (2.44m) standard, 10' (3.04m) available
419 Inside Corner for .080" sheet; Length: 8' (2.44m) standard, 10' (3.04m) available
B. Outside Corners
3448, 3496, 11248 or 11296 Outside Corner
B. Color Matched Caulk

2.03 MATERIALS

A. Vinyl: Palladium® Rigid Vinyl Sheet shall be manufactured from chemical and stain resistant polyvinyl chloride with the addition of impact modifiers. No plasticizers shall be added (plasticizers may aid in bacterial growth).

2.04 ACCESSORIES

A. Top caps, inside corners, divider bars and outside corners shall be made of extruded PVC.
B. Stainless steel top caps shall be made of #400 series stainless steel.
C. Stainless steel vertical divider bars shall be #400 series stainless steel on galvanized steel.
D. Aluminum top caps, inside corners, divider bars shall be extruded from 6063-T5 aluminum.

2.05 FINISHES

A. Color or pattern of Palladium® Rigid Vinyl Sheet to be selected by the architect from the Palladium® Rigid Vinyl Sheet finish selection. Surface shall have a velvet texture.
B. Vinyl Accessories: Top caps, inside corners, divider bars and outside corners shall be of a color matching the IPC.
C. Stainless Steel Accessories: Top caps and divider bars shall have a polished finish.
D. Aluminum Accessories: Top caps, inside corners and divider bars shall be clear anodized.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions in which the rigid vinyl sheet will be installed.
    1. Complete all finishing operations, including painting, before beginning installation of rigid vinyl sheet materials. Paint substrate with a paint or primer that does not contain polyvinyl acetate (PVA).
B. Wall surface shall be dry and free from dirt, grease and loose paint.

3.02 PREPARATION

A. General: Prior to installation, clean substrate to remove dust, debris and loose particles.

3.03 INSTALLATION

A. General: Locate the Palladium® Rigid Vinyl Sheet as indicated on the approved detail drawing for the appropriate substrate and in compliance with the IPC installation instructions. Install level and plumb at the height indicated on the drawings.
B. Installation of Palladium® Rigid Vinyl Sheet
    1. Adhere to substrate with InPro Bond, a freeze-thaw stable, nonflammable, high strength, water based adhesive that trowels on and allows approximately 20 minutes working time before firming.
    2. Adhere to substrate with XT-2000+, a freeze-thaw stable,nonflammable, high strength, water based adhesive that trowels on and allows approximately 20 minutes working time before firming.
    3. Adhere to substrate with Fastbond 30, a nonflammable, high strength, water-dispersed contact adhesive, with very little odor. Smooth roll surface.

3.04 CLEANING

A. At completion of the installation, clean surfaces in accordance with the IPC clean-up and maintenance instructions.

END OF SECTION

SECTION 102613
CORNERGUARDS

PART 1 – GENERAL

1.01 SUMMARY

A. Corner guard system for wall protection

1.02 SECTION INCLUDES

A. 150 BluNose High Impact Surface Mount Corner Guard System

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)
B. National Building Code of Canada (NBC)
C. National Fire Protection Association (NFPA)
D. Society of Automotive Engineers (SAE)
E. Underwriters Laboratory (UL)
F. Underwriters Laboratory of Canada (ULC)
G. Uniform Building Code (UBC)

1.04 SYSTEM DESCRIPTION

A. Performance Requirements: Provide corner guard system that conform to the following requirements of regulatory agencies and the quality control of IPC Door and Wall Protection Systems, InPro Corporation.

1. Fire Performance Characteristics: Provide UL Classified corner guards conforming with NFPA Class A fire rating. Surface burning characteristics, as determined by UL-723 (ASTM E-84), shall be flame spread of 10 and smoke development of 350 - 450. Provide ULC (Canada) listed corner guards conforming to the requirements of the National Building Code of Canada 2010, Subsection 3.1.13. Surface burning characteristics, as determined by CAN/ULC-S102.2, shall be flame spread of 15 and smoke developed of 35.
2. Self Extinguishing: Provide corner guards with a CC1 classification, as tested in accordance with the procedures specified in ASTM D-635-74, Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position, as referenced in UBC 52-4-1988.
3. Impact Strength: Provide rigid vinyl profile materials that have an Impact Strength of 30.2 ft-lbs/inch of thickness as tested in accordance with the procedures specified in ASTM D-256-90b, Impact Resistance of Plastics.
4. System Impact Resistance: Provide a corner guard system that resists an impact of 153.9 ft-lbs while producing no visual blemishes upon the vinyl cover surface and no deformations in the vinyl retainers, as tested in accordance with the applicable provisions of ASTM F 476-84, paragraph 18, Impact Test.
5. GREENGUARD Certified: Provide GREENGUARD Certified material. Profiles shall meet the requirements of GREENGUARD Certification Standards for Low-Emitting Products and GREENGUARD Product Emission Standard for Children & Schools.
6. Chemical and Stain Resistance: Provide corner guards that show resistance to stain when tested in accordance with applicable provisions of ASTM D-543.
7. Fungal and Bacterial Resistance: Provide rigid vinyl that does not support fungal or bacterial growth as tested in accordance with ASTM G-21 and ASTM G-22.
8. Color Consistency: Provide components matched in accordance with SAE J-1545 - (Delta E) with a color difference no greater than 1.0 units

using CIE Lab, CIE CMC, CIE LCh, Hunter Lab or similar color space scale systems.

1.05 SUBMITTALS

A. Product Data: Manufacturer's printed product data for each type of corner guard specified.
B. Detail Drawings: Mounting details with the appropriate fasteners for specific project substrates.
C. Samples: Verification samples of corner guard, 8" (203mm) long, in full size profiles of each type and color indicated.
D. Manufacturer's Installation Instruction: Printed installation instructions for each corner guard.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened factory packaging to the jobsite
B. Inspect materials at delivery to ensure that specified products have been received.
C. Store in original packaging in a climate-controlled location away from direct sunlight.

1.07 PROJECT CONDITIONS

A. Environmental Requirements: Products must be installed in an interior climate-controlled environment.

1.08 WARRANTY

A. Standard IPC Limited Lifetime Warranty against material and manufacturing defects.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturer: IPC Door and Wall Protection Systems, InPro Corporation, PO Box 406 Muskego, WI 53150 USA;
Telephone: 800-222-5556, Fax: 888-715-8407,
Internet address: http://www.inprocorp.com
B. Substitutions: Not permitted
C. Provide all corner guards and wall protection from a single source.

2.02 MANUFACTURED UNITS

A. Corner Guard System
1. 150BN BluNose High Impact Corner Guard Profile
3" (76mm) x 3" (76mm), 90 degree
4' (1.22m), 8' (2.44m) and 9' (2.74m) standard heights
Custom heights available
Custom Angles – Provide vinyl covers and retainers with custom angles. Custom angles shall be between 112.5° and 157.5°. Provide flexible top caps to bend to retainer angle.

Please see finish plan for locations by color:
Color: Seagrass 0230 (for SW Contented 6191 painted walls or Rigid paneled walls)
Color: Clam Shell 0154 (for BM Dove Wing OC-18 painted walls)

2.03 MATERIALS

A. Vinyl Covers: Snap on cover of .080" (2mm) thickness shall be extruded from chemical and stain resistant polyvinyl chloride with the addition of impact modifiers. No plasticizers shall be added (plasticizers may aid in bacterial growth).

B. Vinyl Retainers: Continuous vinyl retainers of .070" (1.8mm) thickness with a co-extruded Biopolymer Flex PVC apex shall be fabricated from polyvinyl chloride with the addition of impact modifiers.

2.04 COMPONENTS

A. Top caps and bottom caps shall be made of injection molded thermoplastics.
B. Fasteners: All mounting system accessories appropriate for substrates indicated on the drawings shall be provided.
C. Optional flexible top caps shall be made of injection molded Biopolymer Flex PVC.

2.05 FINISHES

A. Vinyl Covers: Colors of the corner guard to be selected by the architect from the IPC finish selection. Surface shall have a pebblette texture.
B. Molded Components: Top caps and bottom caps shall be of a color matching the corner guards. Surface shall have a pebblette texture.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions in which the corner guard systems will be installed.
1. Complete all finishing operations, including painting, before beginning installation of corner guard system materials.
B. Wall surface shall be dry and free from dirt, grease and loose paint.

3.02 PREPARATION

A. General: Prior to installation, clean substrate to remove dust, debris and loose particles.

3.03 INSTALLATION

A. General: Locate corner guard as indicated on the approved detail drawings for the appropriate substrate and in compliance with the IPC installation instructions. Install corner guard level and plumb at the height indicated on drawings.
B. Installation of 150BN BluNose High Impact Surface Mount Corner Guard:
1. Retainer Installation
Position the vinyl retainer against the wall, allowing 5/16" (8mm) from the bottom of the retainer to the top of the cove base or baseboard for the bottom cap.
Drywall: Secure the retainer to the wall using #8 x 1-1/4" Phillips round head, self-tapping screws. Stagger the fasteners on each wing of the retainer. Use 6 screws per 4' (1.22m) length, 10 screws per 8' (2.44m) length, or 12 screws per 9' (2.74m) length.
Concrete: Drill 1/4" (6.5mm) holes into the ends of the retainer for the top and bottom caps. Stagger the holes on each wing of the retainer. Use the slotted tabs on the top and bottom cap to transfer hole location to the retainer. Drill 1/4" (6.5mm) holes on the two wings of the retainer. Stagger the fasteners on each wing of the retainer. Drill 6 holes per 4' (1.22m) length, 10 holes per 8' (2.44m) length, or 12 holes per 9' (2.74m) length. Transfer the location of all mounting holes to the wall. Drill 1/4" (6.5mm) holes and position ALLIGATOR anchors into the holes on the wall. Mount the retainer with #10 x 1-3/4" phillips pan head screws and tighten to secure the retainer to the wall.
2. Top and Bottom Cap Installation:
Drywall: Overlap the retainer with the mounting tabs of the top and bottom caps and attach them to the retainer using two, #8 x 1-1/4"

phillips flat head, self tapping screws per cap. Stagger the fasteners on each wing of the cap.

Concrete: Overlap the retainer with the mounting tabs of the top and bottom caps and attach them to the retainer and into the ALLIGATOR anchors using two, #8 x 1-1/2" phillips flat head screws per cap. When installing flexible top caps on custom angle corner guards, use cup washers and flat head screws to fasten the top caps to the retainer.

3. Position the vinyl cover on the retainer to check the fit. Adjust the top cap on the retainer to obtain a tight fit with the vinyl cover. Starting at the top, push the vinyl cover over the retainer pressing over the entire length until the cover snaps securely into place.

INSTALLATION NOTE: Vinyl retainers can be field bent to angles 10° wider or 10° tighter than 90°. When doing so use flexible top and bottom caps or the installation should be full height from floor to ceiling.

3.04 CLEANING

A. At completion of the installation, clean surfaces in accordance with the IPC clean-up and maintenance instructions.

END OF SECTION

SECTION 102616.16
HANDRAILS

PART 1 - GENERAL

1.01 SUMMARY

A. Handrail systems for pedestrian safety and wall protection

1.02 SECTION INCLUDES

A. 1000/1000FV Handrail Systems

1.03 REFERENCES

A. American National Standards Institute (ANSI)
B. American Society for Testing and Materials (ASTM)
C. Americans with Disabilities Act (ADA)
D. National Building Code of Canada (NBC)
E. National Fire Protection Association (NFPA)
F. Society of Automotive Engineers (SAE)
G. Underwriters Laboratory (UL)
H. Underwriters Laboratory of Canada (ULC)
I. Uniform Building Code (UBC)

1.04 SYSTEM DESCRIPTION

A. Performance Requirements: Provide Handrail Systems that conform to the following requirements of regulatory agencies and the quality control of IPC Door and Wall Protection Systems, InPro Corporation.

1. Fire Performance Characteristics: Provide UL Classified handrails conforming with NFPA Class A fire rating. Surface burning characteristics, as determined by UL-723 (ASTM E-84), shall be flame spread of 10 and smoke development of 350 - 450. Provide ULC (Canada) listed handrails conforming to the requirements of the National Building Code of Canada 2010, Subsection 3.1.13. Surface burning characteristics, as determined by CAN/ULCS102.2, shall be flame spread of 15 and smoke developed of 35.

2. Self Extinguishing: Provide handrails with a CC1 classification, as tested in accordance with the procedures specified in ASTM D-635-74, Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position, as referenced in UBC 52-4-1988.

3. Impact Strength: Provide rigid vinyl profile materials that have an Impact Strength of 30.2 ft-lbs/inch of thickness as tested in accordance with the procedures specified in ASTM D-256-90b, Impact Resistance of Plastics.

4. Chemical and Stain Resistance: Provide handrails that show resistance to stain when tested in accordance with applicable provisions of ASTM D-543.

5. GREENGUARD Certified: Provide GREENGUARD Certified material. Profiles shall meet the requirements of GREENGUARD Certification Standards for Low-Emitting Products and GREENGUARD Product Emission Standard for Children & Schools.

6. Fungal and Bacterial Resistance: Provide rigid vinyl that does not support fungal or bacterial growth as tested in accordance with ASTM G-21 and ASTM G-22.

7. Color Consistency: Provide components matched in accordance with SAE J-1545 - (Delta E) with a color difference no greater than 1.0 units using CIE Lab, CIE CMC, CIE LCh, Hunter Lab or similar color space scale systems.

1.05 SUBMITTALS

A. Product Data: Manufacturer's printed product data for each product indicated in this section.
B. Detail Drawings: Mounting details with the appropriate fasteners for specific project substrates.
C. Samples: Verification samples of handrail, 8" (203mm) long, in full size profiles of each type and color indicated.
D. Manufacturer's Installation Instructions: Printed installation instructions for each handrail.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened factory packaging to the jobsite
B. Inspect materials at delivery to assure that specified products have been received.
C. Store in original packaging in a climate controlled location away from direct sunlight.

1.07 PROJECT CONDITIONS

A. Environmental Requirements: Install products in an interior climate controlled environment.

1.08 WARRANTY

A. Standard IPC Limited Lifetime Warranty against material and manufacturing defects.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturer: IPC Door and Wall Protection Systems, InPro Corporation, PO Box 406, Muskego, WI 53150, USA; Telephone: 800-222-5556, Fax: 888-715-8407, Internet address: http://www.inprocorp.com
B. Substitutions: Not permitted
C. Provide all handrails and wall protection from a single manufacturer.

2.02 MANUFACTURED UNITS

A. Handrail Profile
1. 1000FV Handrail, 4-5/16" (110mm) height x 1-5/8" (41mm) gripping diameter, extends 3-1/8" (79mm) from wall. Handrail has a full-wrap woodgrain pattern. Returns and corners include reveals.
Color: Washed Walnut 5E030

2.03 MATERIALS

A. Vinyl: Snap-on covers of .080" (2mm) thickness shall be extruded from chemical and stain resistant unplasticized polyvinyl chloride (uPVC) with the addition of impact modifiers. No plasticizers shall be added (plasticizers may aid in bacterial growth). Accent strips when used shall be of polyvinyl chloride.
B. Aluminum: Continuous aluminum retainer of .080" (2mm) thickness shall be fabricated from 6063-T5 aluminum with a mill finish.

2.04 COMPONENTS

A. Returns, inside corners, outside corners and brackets shall be made of injection molded thermoplastics.
B. Molded reveals shall have a smooth finish and shall be black.
C. Fasteners: All mounting system accessories appropriate for substrates indicated on the drawing shall be provided.

2.05 FINISHES

A. Vinyl Covers: Handrail colors to be selected by the architect from the IPC finish selection.
B. Molded components: Returns, inside corners and outside corners shall be of a color matching the handrails. Surface shall have a pebblette texture.
C. Molded Bracket: Shall be a solid color to match or compliment the handrails. Surface shall have a pebblette texture.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions in which the handrail system will be installed.
1. Complete all finishing operations, including painting, before beginning installation of handrail system materials.
2. Wall surface shall be dry and free from dirt, grease and loose paint.

3**.02 PREPARATION**

A. General: Prior to installation, clean substrate to remove dust, debris and loose particles.

3.03 INSTALLATION

A. General: Locate handrail as indicated on approved detail drawings for the appropriate substrate and in compliance with the IPC installation instructions. Install handrail level and plumb at the height indicated on the drawings.
B. Installation of 1000/1000FV Handrails:
1. Cut the aluminum retainer to the desired length, allowing 3-3/8" (86mm) for each return, 1/4" (7mm) for each outside corner and 4-7/8" (124mm) for each inside corner. Allow 1/4" (6mm) for each 135 degree outside corner and 2-1/16" (52mm) from the corner of the wall for each 135 degree inside corner.
2. Slide reveals onto returns and corners. Attach returns, inside corners, outside corners and brackets to the aluminum retainer. It is recommended that brackets are installed 4" (102mm) from the ends of a run. Spacing of brackets is recommended to be a maximum of 32" (813mm).
3. Mount the aluminum retainer to the wall using the provided fasteners. Level and secure the aluminum retainer to the wall.
4. Cut the vinyl cover to fit between the reveals on the returns and/or corners.

NOTE: Trim all factory edges square before installation. Position he vinyl cover on the aluminum retainer starting at the top of the retainer and pivoting the vinyl cover over the bottom of the retainer until it snaps into place.

3.04 CLEANING

A. At completion of the installation, clean surfaces in accordance with the IPC clean-up and maintenance instructions.

END OF SECTION

SECTION 102800
TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

SUMMARY

This Section includes the following toilet accessory items:

- Recessed waste receptacle
- Mirrors with integrate hand towel dispenser and soap dispenser
- Grab bars
- Full length Mirrors
- Feminine napkin disposal units
- Toilet paper dispensers
- Hooks

SUBMITTALS

Submit the following:

Product Data for each toilet accessory item specified, including details of construction relative to materials, dimensions, gages, profiles, method of mounting, specified options, and finishes.

Setting Drawings: Where cutouts are required in other work, provide templates, substrate preparation instructions, and directions for preparing cutouts and for installation of anchorage devices.

QUALITY ASSURANCE

Inserts and Anchorages: Furnish all inserts, reinforcing plates and anchoring devices as recommended by manufacturer for secure surface mounting to all types of wall and partition for all units specified.

Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect.

PROJECT CONDITIONS

Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide toilet accessories by one of the following:

- American Specialities, INC
- Bobrick

FABRICATION

Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Provide concealed anchorage wherever possible.

PART 3 - EXECUTION

INSTALLATION

Install toilet accessory units in accordance with manufacturers' instructions, using fasteners appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, in accordance with manufacturer's instructions for type of substrate involved. Install bottom of mirror no higher than 40" above the finish floor.

Install grab bars at all handicapped toilet stalls as shown on the drawings. Each handicap stall to have three grab bars. One 36" bar shall be mounted on the rear wall of the stall behind the toilet, located a max. of 6" from the corner of the stall. The second 48" bar shall be mounted on the wall or partition adjacent to the side of the toilet, located a max. of 12" from the corner nearest the toilet. The third 18” bar shall be mounted vertically directly above the 48” bar. See drawings for mounting heights & locations.
Install toilet tissue dispensers at all toilet stalls. Mount dispensers on walls or partitions adjacent to the side of the toilet 17" at student toilets and 22" at teacher toilets from floor surface to centerline of dispenser, and 28" from face of rear stall wall behind toilet to centerline of dispenser.

Install sanitary napkin disposal units at all female toilet stalls and other locations as shown or noted. Mount disposal units on walls or partitions adjacent to the side of the toilet 24" above floor surface to top of unit and 42" from face of rear stall wall behind toilet to centerline of disposal unit.

Install paper towel dispensers near lavatories in locations as directed by the Architect. Mount bottom of dispenser 48" max. above the finish floor surface.

ADJUSTING AND CLEANING

Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

Clean and polish all exposed surfaces in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings.

TOILET ACCESSORIES SCHEDULE

Furnish and install toilet accessories indicated “TA-1, TA-2,” etc. on the plans in accordance with Toilet Accessories schedule as shown on the drawings.

END OF SECTION

SECTION 104400
FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section includes the following:

- Fire extinguishers
- Fire extinguisher cabinets

SUBMITTALS

General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

Product data for each type of product specified. For fire extinguisher cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

Samples: Submit for verification purposes, samples of each required finish. Prepare samples on metal of same gage as used for actual production run.

QUALITY ASSURANCE

Single-Source Responsibility: Obtain fire extinguishers and cabinets from one source from a single manufacturer.

UL-Listed Products: Fire extinguishers UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

MANUFACTURERS

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

- J.L. Industries,
- Larsen's Manufacturing Co.,
- Modern Metal Products.

FIRE EXTINGUISHERS

General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, which comply with requirements of governing authorities.

Abbreviations indicated below identify extinguisher types related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.

Multipurpose Dry Chemical Type: UL-rated 4-A:80-B:C, 10-lb. nominal capacity in enameled steel container.

Manufacturers Model Numbers:

J.L. Industries	Cosmic 10E
Larsen Mfg. Co.	MP-10

FIRE EXTINGUISHER CABINETS

General: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated.

Manufacturer's Model Numbers:

J. L. Industries	Academy Series, 1027-V-17, Vertical Duo, Tempered Glass.
Larsen Mfg. Co.	Architectural Series, AL-2409-R4, Vertical Duo, Tempered Glass.

Construction: Manufacturer's heavy gauge, baked enamel box, with clear satin anodized aluminum door and frame, and with hardware to suit cabinet type, trim style, and door style indicated.

Cabinet Type: Suitable for mounting conditions indicated, of the following types:

Semi-recessed in masonry walls.
Semi-recessed in gypsum bd./metal stud walls.

Identify fire extinguisher in cabinet with black die-cut lettering spelling "FIRE EXTINGUISHER" applied at the bottom of the door. Provide lettering to comply with requirements indicated for letter style, color, size, spacing, and location as selected by Architect from manufacturer's standard arrangements.

Glass Panel: 1/4" Clear tempered glass.

Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam action latch, or door pull, exposed or concealed, and friction latch and cylinder lock. Provide concealed or continuous-type hinge permitting door to open 180 deg.

Protect mechanical finishes on exposed surfaces from damage by application of strippable, temporary protective covering prior to shipment.

Finish: **Cabinet door and trim finish to be selected by Architect from manufacturer’s full line.**

MOUNTING BRACKETS:

Provide manufacturer's standard bracket designed to prevent accidental dislodgement of extinguisher, of sizes required for type and capacity of extinguisher indicated, in manufacturer's standard plated finish.

Provide brackets for extinguishers not located in cabinets.

PART 3 - EXECUTION

INSTALLATION

Furnish and install the following number of fire extinguishers and cabinets in locations as shown on the drawings, or if not indicated on the drawings turn over the remaining equipment to the Owner to be installed at a later date:

Fire Extinguishers: Furnish number indicated on Life Safety Plan.

Fire Extinguisher Cabinets: Furnish number of cabinets to match extinguishers.

Install items included in this section at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities. Maximum height of recessed cabinets shall be 4'-0" A.F.F. to centerline of cabinet.

Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.

Location: Where exact location of recessed cabinets and fire extinguishers is not indicated, locate as directed by Architect.

END OF SECTION

SECTION 113100
APPLIANCES

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to work of this section.

Allowance requirements are specified in Section 012100.

Plumbing requirements are specified in Division 15.

Ductwork and Ventilation is specified in Division 15.

Electrical services and connections are specified in Division 16.

DESCRIPTION OF WORK:

Extent of appliances required is indicated on drawings and by provisions of this section.

Types of appliances required include the following:

Residential Refrigerators
Residential Range Ovens
Residential Range Hoods
Residential Disposals

QUALITY ASSURANCE:

Certification Labels: Provide equipment which complies with standards and bears certification labels as follows:

Energy Ratings: Provide energy guide labels with energy cost analysis (annual operating costs) and efficiency information as required by Federal Trade Commission.

UL Standards: Provide residential equipment with UL labels.

ANSI Standards: Provide gas-burning equipment with American Gas Assoc. (AGA) seal of approval, complying with ANSI Z21-series seal of approval.

Uniformity: Provide products of same manufacturer for each type of residential equipment required.

SUBMITTALS:

Product Data: Submit manufacturer's specifications and installation instructions for each type of appliance, including data indicating compliance with requirements. Submit operating and maintenance instructions for each appliance.

DELIVERY AND STORAGE:

Deliver products to project site in manufacturer's undamaged protective containers, after spaces to receive them have been fully enclosed.

SPECIFIED PRODUCT WARRANTIES:

Submit manufacturer's standard written warranty for each item of residential equipment.

PART 2 - PRODUCTS

MATERIALS AND FABRICATION:

Products & Manufacturers: See this section for model numbers and manufacturers of specified appliances.

Colors: As selected from manufacturer's full line or as shown on the drawings.

RESIDENTIAL REFRIGERATOR

To be furnished under 012010 Allowances

RESIDENTIAL RANGE OVENS

To be furnished under 012010 Allowances

RESIDENTIAL RANGE HOODS

To be furnished under 012010 Allowances

RESIDENTIAL DISPOSALS

To be furnished under 012010 Allowances

PART 3 - EXECUTION

INSTALLATION:

General: Comply with manufacturer's instructions and recommendations.

Built-In Equipment: Securely anchor units to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate for proper operation of equipment.

Utilities: Connect Appliances to electrical, plumbing and ventilation as applicable.

ADJUST AND CLEAN:

Testing: Test each item of residential equipment to verify proper operation. Make necessary adjustments.

Accessories: Verify that accessory items required have been furnished.

Cleaning: Remove packing material from appliance items and leave units in clean condition, ready for operation.

END OF SECTION

SECTION 122100
WINDOW BLINDS

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

Furnish and install venetian blinds as specified herein in the following locations:

- At each exterior window

SUBMITTALS

Shop Drawings - Submit manufacturer's technical literature and shop drawings to Architect for approval, indicating all dimensions and methods of installation.

Samples - Submit manufacturer's full range of standard colors available.

DELIVERY, STORAGE, AND HANDLING

Deliver materials to the project site in original unopened packaging with labels intact.

Storage: Materials shall be stored in a clean area which is free of corrosive fumes, dust, and away from construction activities. Materials shall be stacked horizontally using plastic or wood shims such that drainage and ventilation are provided for, and such that water cannot accumulate in, about or upon the containers.

Stacks shall be covered with tarpaulins or plastic such that ventilation is provided for, and such that contaminants are prevented from contacting surfaces.

PART 2 - PRODUCTS

MANUFACTURER

For the purpose of establishing type and quality, venetian blinds shall be one of the following:

Macro 2”•	Hunter Douglas
Riviera Contract 2” •	Levelor
2” Horizontal Blind •	Bali
2” Horizontal Blind •	Graber Industries, Inc.

MATERIALS

Venetian Blinds shall be as follows:

Slats - 2 inch wide, .006 thick virgin aluminum with baked enamel finish in standard color as selected by Architect.

Bottom Rail - Manufacturer's standard construction and finish

Head Rail - .025 sheet steel galvanized, bonderized, with baked enamel finish as selected by Architect.

Braided Ladder - Synthetic yarn with equally spaced rungs, with minimum of 14 slats per foot.

Liftcords - Braided synthetic fiber, .070 inch diameter.

Slat Tilter - Clear lucite.

PART 3 - INSTALLATION

Furnish and install manufacturer's standard installation brackets in finish to match headrail and to suit job conditions by methods as recommended by manufacturer.

Location - Install blinds at each window in recess between jambs.

Tilters shall be located at left side of each blind.

After installation blinds shall be protected and kept clean until final acceptance by drawing up blind to headrail, and covering with plastic sheeting. Blinds found to be damaged in any way at time of final inspection shall be replaced.

END OF SECTION

SECTION 14 21 01
ELECTRIC TRACTION PASSENGER ELEVATOR RENOVATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Electric traction passenger elevators renovations as shown and specified. Elevator work includes:
   1. Providing spare door parts.
   2. Upgrading car buttons to vandal resistant quality.

B. Related Sections:
   1. Division 1 General Requirements: Meet or exceed all referenced sustainability requirements.

1.02 SUBMITTALS

A. Product data: When requested, the elevator contractor shall provide standard cab, entrance and signal fixture data to describe product for approval.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: An approved manufacturer with minimum 15 years of experience in manufacturing, installing, and servicing elevators of the type required for the project.
   1. The manufacturer of machines, controllers, signal fixtures, door operators, cabs, entrances, and all other major parts of elevator operating equipment.
      a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
   2. The manufacturer shall have a documented, on-going quality assurance program.
   3. ISO-9001:2000 Manufacturer Certified
   4. ISO-14001:2004 Environmental Management System Certified
   5. LEED Gold certified elevator manufacturing facility.

B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:
   1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
   2. NFPA 70 National Electrical Code.
   3. NFPA 80 Fire Doors and Windows.
   4. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
   5. Section 407 in ICC A117.1, when required by local authorities
   6. CAN/CSA C22.1 Canadian Electrical Code
   7. CAN/CSA B44 Safety Code for Elevators and Escalators.

1.04 DELIVERY, STORAGE AND HANDLING

A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.05 PROJECT CONDITIONS

A. Temporary Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

1.06 WARRANTY

A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Current maintenance contract is with TK Elevator Corporation. Contact Tara Downs: email tara.downs@tkelevator.com , phone 770-733-5493

2.02 HOISTWAY ENTRANCES

A. Doors and Frames: Provide spare parts for doors as follows:
   1. Interlocks
   2. Pick Up Rollers
   3. Spirators

2.03 CAR OPERATING STATIONS (2 CARS)

A. Car Operating Station, General: TK Elevator proposes to furnish the necessary labor and material to upgrade the push buttons on the Ervin Towers' elevators to a vandal resistant, stainless steel style. This new vandal resistant style is much less likely to break from heavy use. Proposal includes replacement of all buttons with contact blocks being retained. All work to be completed during normal business hours.

2.04 CAR INTERIORS (2 CARS)

A. Remove existing car ceilings. Install TK Downlight Ceiling with six or nine LED lights based on cab size.
B. Wrap existing car wall panels with 3M Di-Noc architectural film in color and pattern selected by Architect from manufacturer’s standard offerings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.
   1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
   2. Comply with the National Electrical Code for electrical work required during installation.

B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.

C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.

3.03 FIELD QUALITY CONTROL

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.04 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.05 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
   1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.06 PROTECTION

A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

TK Elevator proposes to furnish the necessary labor and material to upgrade the push buttons on the Ervin Towers' elevators to a vandal resistant, stainless steel style. This new vandal resistant style is much less likely to break from heavy use. Proposal includes replacement of all buttons with contact blocks being retained. All work to be completed during normal business hours.

END OF SECTION

SECTION 14 21 23.16
MACHINE ROOM-LESS ELECTRIC TRACTION PASSENGER ELEVATORS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Machine room-less electric traction passenger elevators as shown and specified. Elevator work includes:
   1. Gearless electric traction passenger elevators.
   2. Elevator car enclosures, hoistway entrances and signal equipment.
   3. Operation and control systems.
   4. Accessibility provisions for physically disabled persons.
   5. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
   6. Materials and accessories as required to complete the elevator installation.

B. Related Sections:
   1. Division 1 General Requirements: Meet or exceed all referenced sustainability requirements.
   2. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
   3. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
   4. Division 5 Metals:
      a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
      b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
   5. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
   6. Division 16 Sections:
      a. Providing electrical service to elevators, including fused disconnect switches where permitted. (note: fused disconnect switch to be provided as part of elevator manufacture product)
      b. Emergency power supply, transfer switch and auxiliary contacts.
      c. Heat and smoke sensing devices.
      d. Convenience outlets and illumination in control room (if applicable), hoistway and pit.
   7. Division 22 Plumbing
      a. Sump pit
   8. Division 23 Heating, Ventilation and Air Conditioning
      a. Heating and ventilating hoistways and/or control room.

C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Part 2 for traction elevators. State or local requirements must be used if more stringent. The cost of this work is not included in the TK Elevator’s proposal, since it is a part of the building construction.
   1. A plumb and legal hoistway, properly framed and enclosed an including a pit of proper depth, and a pit ladder for each elevator. Hoistway walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point. Drains, lights, access doors, waterproofing and hoistway ventilation, as required.
   2. Elevator controller space
      a. Door jamb controller option - controller landing wall thickness must be a minimum of 8 1/2 inches thick. This is due to the controller being mounted on the top floor landing in the door frame on the return side of the door. For center opening doors,

the controller is located on the right-hand frame (from inside the elevator cab looking out). Provide telephone line, light fixture (200 lx / 19 fc), and convenience outlet in the hoistway at the landing where the elevator controller is located. Final location must be coordinated with elevator contractor. These requirements must be coordinated between the general contractor and the elevator contractor.

b. Control room option - provide a suitable control closet with access and ventilation in accordance with all applicable codes and regulations. The control closet shall be maintained at a temperature between 32 F (0 C) and 104 F (40 C). To be measured at 6 feet (1830 mm) above the floor and 1 foot (305 mm) out from the front center of the car controller(s). Relative humidity is not to exceed 95% non-condensing. Local codes may require tighter temperature ranges, and higher ventilation levels, please check with your local code authority for the exact requirements in your area. If your control closet temperatures exceed these requirements, contact your local TK Elevator sales representative for assistance. All telephone wiring to controller room control panel, and installation of telephone instrument or other communication equipment in elevator cab with all connections to elevator in controller room.

3. Hoistway must be maintained between 32ºF (0ºC) and 122ºF (50ºC) measured at the machine.
4. Adequate supports to carry the loads of all equipment, including overhead machine and machine beams located in hoistway including supports for guide rail brackets.
5. Complete 3 phase connections from the electric power mains to each controller, including necessary circuit breakers and fused mainline disconnect switches unless otherwise specified herein by elevator manufacture.
6. Electric power of the same characteristics as the permanent supply without charge for the construction, testing and adjusting.
7. Provide proper piping and conduit.
8. Divider beams for rail bracket support as required.
9. Cutting of walls floor, etc. and removal of such obstructions as may be necessary for proper installation of the elevator.
10. Grouting of door sills, hoistway frames, and signal fixtures after installation of the elevator equipment.
11. All painting, except as otherwise specified.
12. Provide hoistway walls designed and constructed in accordance with the required fire rating (including those places where elevator fixture boxes, rail bracket fastenings, and any other penetration into the hoistway walls).
13. Temporary enclosures, barricades and other protection from open hoistways and elevator work area during the time the elevator is being installed to meet all permanent installation safety codes. A temporary work platform to be provided at the top landing across the hoistway; if required, it should conform to all code and safety requirements.
14. Smoke detector\ sensing devices and contacts wired to elevator control as required by local code. A means to automatically disconnect the main line power supply to the elevator prior to the application of water in the elevator controller room shall be furnished by the electrical contractor. This means shall not be self-resetting.
15. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
16. A standby power source, including necessary transfer switches and auxiliary contact, where elevator operation from an alternate power supply is required.
17. Adequate storage facilities for elevator equipment prior to and during installation at ground level within 150 feet of hoistway.
18. Setting of anchors and sleeves.

19. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
20. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.
21. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.
22. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.

1.02 SUBMITTALS

A. Product data: When requested, the elevator contractor shall provide standard cab, entrance and signal fixture data to describe product for approval.

B. Shop drawings:
   1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
   2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
   3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
   4. Indicate electrical power requirements and branch circuit protection device recommendations.

C. Powder Coat paint selection: Submit manufacturer’s standard selection charts for exposed finishes and materials.

D. Plastic laminate selection: Submit manufacturer’s standard selection charts for exposed finishes and materials.

E. Metal Finishes: Upon request, standard metal samples provided.

F. Operation and maintenance data. Include the following:
   1. Owner’s manuals and wiring diagrams.
   2. Parts list, with recommended parts inventory.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: An approved manufacturer with minimum 15 years of experience in manufacturing, installing, and servicing elevators of the type required for the project.
   1. The manufacturer of machines, controllers, signal fixtures, door operators cabs, entrances, and all other major parts of elevator operating equipment.
      a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
   2. The manufacturer shall have a documented, on-going quality assurance program.
   3. ISO-9001:2000 Manufacturer Certified
   4. ISO-14001:2004 Environmental Management System Certified
   5. LEED Gold certified elevator manufacturing facility.

B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:
   1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
   2. NFPA 70 National Electrical Code.
   3. NFPA 80 Fire Doors and Windows.
   4. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
   5. Section 407 in ICC A117.1, when required by local authorities
   6. CAN/CSA C22.1 Canadian Electrical Code
   7. CAN/CSA B44 Safety Code for Elevators and Escalators.

D. Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).

E. Inspection and testing:
   1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
   2. Arrange for inspections and make required tests.
   3. Deliver to the Owner upon completion and acceptance of elevator work.

F. Sustainable Product Qualifications:
   1. Environmental Product Declaration:
      a. GOOD: If Product Category Rules (PCR) are not available, produce a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that has at least a cradle to gate scope.
      b. BEST: If Product Category Rules (PCR) are available, produce and publish an Environmental Product Declaration (EPD) based on a critically reviewed life-cycle assessment conforming to ISO 14044, with external verification recognized by the EPD program operator.
   2. Material Transparency:
      a. GOOD: Provide Health Product Declaration at any level
      b. BETTER: Provide Health Product Declaration (HPD v2 or later). Complete, published declaration with full disclosure of known hazards, prepared using the Health Product Declaration Collaborative's "HPD builder" on-line tool.
      c. BEST: Cradle to Cradle Material Health Certificate v3, Bronze level or higher.
   3. LEED v4 – Provide documentation for all Building Product Disclosure AND Optimization credits in LEED v4 for product specified.
   4. Living Building Challenge Projects: Provide Declare label for products specified.

1.04 DELIVERY, STORAGE AND HANDLING

A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.05 PROJECT CONDITIONS

A. Temporary Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

1.06 WARRANTY

A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

1.07 MAINTENANCE

A. Furnish maintenance and call back service for a period of 12 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours excluding callbacks.
   1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.
   2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
   3. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Design based around TK Elevator’s evolution 200 Self-Supported Machine Room-Less elevator. Contact Brandon.Derry@tkelevator.com 770-733-5493

2.02 MATERIALS, GENERAL

B. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and carpet shall have an EPD and an HPD, and shall meet the California Department of Public Health Standard Method V1.1–2010, CA Section 01350 as mentioned in 1.03.9 of this specification.

C. Colors, patterns, and finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.

D. Steel:
   1. Shapes and bars: Carbon.
   2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
   3. Finish: Factory-applied powder coat for structural and architectural parts. Color selection must be based on elevator manufacture’s standard selections.

E. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection must be based on elevator manufacture’s standard selections.

F. Flooring by others.

2.03 HOISTWAY EQUIPMENT

A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.

B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.

C. Deflector Sheaves: None

D. Guide Rails: Dry, non-lubricated steel, fastened to the building with steel brackets.

E. Guides: Guide shoes or roller guides with a minimum of three tires shall be mounted on top and bottom of the car and counterweight frame and be held in contact with the guide rail by adjustable devices.

F. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.

G. Machine: The hoisting machine shall be a compact energy efficient permanent magnet Gearless traction type, consisting of PMAC motor, brake and driving sheave mounted on a rigid bedplate in the top of the hoistway. A large solid, forged shaft shall serve as a support for the motor rotor assembly and for the drive sheave and brake system. It shall be supported by roller bearings mounted in the machine housing.

H. Drive System:
    1. The drive system shall be of the Variable Voltage Variable Frequency (VVVF) regenerative.
    2. The system shall be a vector controlled pulse-width modulated AC drive. The variable voltage variable frequency drive shall convert the AC power supply using a two-step process to a variable voltage variable frequency power supply for use by the hoist motor.
    3. The speed control shall be by means of vector control providing direct torque and field excitation automatically provided by permanent magnet. A digital absolute velocity encoder shall be provided giving feedback to the controller on armature position and motor speed.
    4. Dual solid state electronics (IGBT Insulated Gate Bipolar Transistor) in series shall be used in place of mechanical contactors.

I. Motor/Machine: The motor shall be PMAC, totally enclosed, non-ventilated with class "F" insulation. The motor armature shall be dynamically balanced and supported by roller bearings of ample capacity. The armature and driving sheave shall be properly balanced for smooth, high-speed elevator performance. The PM machine shall be mounted horizontally in the top of the hoistway in a unitized formed steel structure on bearing plates furnished by the elevator installer. The unitized formed steel structure shall be securely fastened to the supports supplied by other trades.

J. Brake: The brake shall be a spring applied electric brake; held open by an electro-magnet actuated by a digital brake controller and designed to make smooth, positive stops. The Brake shall be designed to automatically apply in the event of interruption of power supply from any cause. Operation and control of the brake shall be all digital. The setting and lifting of the brake shall be software based and all electronic. All adjustments and setup of the brake shall be made using a PC interface. No contactors or resistors shall be used in the actuation of the brake.

K. Suspension Belts and Governor Rope: Suspension belts shall be flat belts of polyurethane with an inner core of 14 steel cords with an FT1 fire rating such that hoistway sprinklers are not required by NFPA-13. Each belt shall have a suspension strength of 60 KN (13,488 pounds).
    1. Four to six belts shall be used depending on the car capacity.
    2. Suspension tension monitor shall detect differences in belt tension and for loss of tension. If fault is detected, the car shall stop at the nearest floor and an Out of Service call be registered.
    3. Trip criteria shall be monitored and data shall be stored in redundant non-volatile locations. Belts shall be replaced prior to the end of service life. Messages shall be issued at 180, 90, and 30 days prior to the last day of service life.
    4. Governor ropes shall be of iron construction.
    5. Any special tools, devices, software or equipment required for monitoring the wear of suspension shall be included with the installation of the equipment and become the property of the owner at time of elevator completion. This includes special ongoing monitoring systems, special tools and instruction needed to monitor the suspension system.

L. Counterweight: Counterbalance each elevator for smooth and economical operation by using iron or steel plate weights securely fastened in a steel counterweight frame. Counterweight shall equal the weight of the complete elevator car and approximately 50 percent of the specified capacity load.

M. Safety and Governor: Car safety shall be mounted on the bottom members of the car frame and be operated by a centrifugal speed governor. The governor shall be designed to cut off power to the motor and apply the brake whenever the governor indicates the car has excessive speed. The governor shall function when the car over speeds.

N. Emergency Terminal Limits: Place electric limit devices in the hoistway near the terminal landings. Limit switch(es) shall be designed to cut off the electric current and stop the car if it runs beyond either terminal landing.

O. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

2.04 HOISTWAY ENTRANCES

A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction. 4’ 6” wide X 7’ 0” tall doors.
    1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates (where required), sight guards, and necessary hardware.
    2. Main landing door & frame finish: ASTM A1008 steel panels, factory applied powder coat finish with factory-applied powder coat finish entrance frame. 16 Ga door thickness.
    3. Typical door & frame finish: ASTM A366 steel panels, factory applied powder coat enamel finish with factory-applied powder coat finish entrance frame. 16 Ga door thickness.

B. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

C. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
    1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
    2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
    3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

D. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.05 PASSENGER ELEVATOR CAR ENCLOSURE

A. Car Enclosure:
    1. Walls: Cab type TKS, reinforced cold-rolled steel. Walls shall be finished with factory applied powder coat.
    2. Reveals and frieze: Not Applicable
    3. Canopy: Cold-rolled steel with hinged exit.
    4. Ceiling: Suspended type, LED lighting with translucent diffuser mounted in a metal frame. Framework shall be finished with a factory applied powder coat finish.
    5. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel
    6. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
        a. Door Finish: Stainless steel panels: No. 4 brushed finish.
        b. Cab Sills: Extruded aluminum, mill finish.
    7. Handrail: Provide 4' flat metal bar on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
    8. Ventilation: Manufacturer’s standard exhaust fan, mounted on the car top.
    9. Protection pads and buttons: Provide one set of vinyl protection pads with metal grommets for the project. Provide pad buttons on cab front(s) and walls.

B. Car Top Inspection: Provide a car top inspection station with an “Auto-Inspection” switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station shall give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.06 DOOR OPERATION

A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or

when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.

1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel shall reverse and the door shall reopen to answer the other call.
4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer shall sound. When the obstruction is removed, the door shall begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors shall stop and resume closing only after the obstruction has been removed.
5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen. After the obstruction is cleared, the doors shall begin to close.
6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors shall recycle closed then attempt to open six times to try and correct the fault.
7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors shall recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

B. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.07 CAR OPERATING STATION

A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Wrap return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED’s shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.

B. Emergency Communications System: Integral phone system provided.

C. Auxiliary Operating Panel:

D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel.

The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.

E. Special Equipment:
Limited Access Operation: Keyswitch and card reader space.(card reader by others)

2.08 CONTROL SYSTEMS

A. Controller: The elevator control system shall be microprocessor based and software oriented. The system shall operate in real time, continuously analyzing the car(s) changing position, condition, and work load. All controller and operational circuits including the brake control and drive system shall be digital. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.
   1. Momentary pressing of one or more buttons shall dispatch the car to the designated landings in the order in which the landings are reached by the car, irrespective of the sequence in which the buttons are pressed. Each landing call shall be canceled when answered.
   2. When the car is traveling in the up direction, it shall stop at all floors for which car buttons or "up" hall buttons have been pressed. The car shall not stop at floors where "down" buttons have been pressed, unless the stop for that floor has been registered by a car button or unless the down call is at the highest floor for which any buttons have been pressed. Pressing the "up" button when the car is traveling in the down direction shall not intercept the travel unless the stop for that floor has been registered by a car button or unless the up call is the lowest for which any button has been pressed.
   3. When the car has responded to its highest or lowest stop, and stops are registered for the opposite direction, its direction of travel shall reverse automatically and it shall then answer the calls registered for that direction. If both up and down calls are registered at an intermediate floor, only the call corresponding to the direction of car travel shall be canceled upon the stopping of the car at the landing.
   4. A car that is stopping for the last hall call in the preference direction, and that hall call is for the opposite direction with no onward car calls, shall reverse preference when the selector position advances to the landing at which the car is committed to stop. A car that is stopping for the last hall call in the preference direction, and that hall call is for the same direction, shall hold its preference until the door is almost closed allowing time for a passenger to register an onward car call which shall maintain the preference. If no car call is registered before the door is almost closed, the car shall lose its preference and shall be available to accept calls in either direction.

B. Operation: Selective Collective – ETA based. The system is optimized to get a car to the floor where a hall call has been registered, in the shortest time. The system receives input information from standard call pushbuttons located in the hall, car position and car load information from individual car loadweighers.

   1. When group operation is required, the group supervisory operation shall be embedded within selected car controllers. No separate group controller shall be supplied. The microprocessor shall constantly scan the system for hall calls. When hall calls are registered, the control system shall immediately calculate the estimated time for arrival using such information as, number of floors to travel from the current position, the time it takes to travel one floor at top speed, calls assigned to a car, and car reversal time to

respond to a call in the opposite direction of travel. When a car's status changes or additional hall calls are registered, the estimated time of arrival shall be recalculated and calls reassigned if necessary.

2. Traffic Pattern: The microprocessor shall provide flexibility to meet well defined patterns of traffic, including up peak, down peak, and heavy interfloor demands, and adjust for indeterminate variations in these patterns which occur in buildings.
3. Artificial Intelligence: Artificial Intelligence shall be an integral part of the group control system software. The enhanced artificial intelligence shall optimize the interfloor traffic performance. Inputs for the artificial intelligence shall include accurate passenger load from an electronic loadweigher, probable car calls generated from each hall call, type of building and observed traffic patterns.

C. Load Weighing Device: Provide a load weighing device on each car which, when the particular car is filled to an adjustable percentage of the capacity load, shall cause the car to bypass landing calls but not car calls. The passed landing calls shall remain registered for the next following car.

1. The device shall be unaffected by the action of compensating chain or rope. The device shall detect a 50 pound (23 Kg.) load change under all conditions.
2. The load sensor shall use a load cell to accurately measure the weight in the car. The information shall be transferred via a serial link to the elevator controller.

D. Anti-Nuisance Call Control: The microprocessor control system shall evaluate the number of people on the car and compare that value to the number of car calls registered. If the number of car calls exceeds the number of people by a field programmable value, the car calls shall be canceled after the first call has been answered.

E. Position Selector: The position selector shall be part of the microprocessor system. The car position in the hoistway shall be digitized through a primary position encoder. The microprocessor control system shall store the floor position and slow down points in memory.

F. Motion Control: The drive control system shall be dual-loop feedback system based primarily on car position. The velocity profile shall be calculated by the microprocessor control system producing extremely smooth and accurate stops. The velocity encoder shall permit continuous comparison of machine speed to velocity profile and to actual car speed. This accurate position/velocity feedback shall permit a fast and accurate control of acceleration and retardation.

G. Motor Pre-Torque: Current shall be applied to the elevator drive before the brake is released and the speed pattern is dictated to eliminate roll back and sling shot effects of unbalanced loads in the car. The electronic loadweigher shall determine the load on the car determining a pre-torque reference to send to the drive.

H. Emergency Power Operation: This operation is only available with Green Drive. Once the loss of normal power has been detected, the elevator car is moved up or down to the next available landing, depending on the load in the car and will open the doors. After passengers have exited the elevator, the doors are closed. It is NOT designed to lower the car to a specified landing such as Battery Lowering used for Hydraulic applications. For a Green Drive auto rescue, an isolation transformer is NOT required, unless building power voltage matching is necessary. A single rescue unit is not capable of rescuing a group of cars --- this is a per car option. Maximum travel on rescue operation is 160 feet. This feature is included in the elevator contract and does not utilize a building-supplied standby power source.

I. Destination Dispatch: Not Applicable

J. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.

K. Special Operation:
Limited Access Operation: A key switch shall be provided to initiate the Limited Access Operation. The activation of this operation shall restrict the operation of the elevator car calls to selected floors on a per-floor, per elevator basis. Travel to the restricted floors shall be allowed after the entry of the required access code via a card reader device supplied by others. The card reader entry shall override the car call restrictions and allow entry of a car call to a restricted floor.

2.09 HALL STATIONS

A. Hall Stations, General: Vandal resistant buttons with center jewels which illuminate to indicate that a call has been registered at that floor for the indicated direction. Each button shall be provided with an internal automatic stop to prevent damage of switches that register the call. Provide 1 set of pushbutton risers. All fixtures shall be vandal resistant type.
    1. Provide one pushbutton riser with faceplates having a brushed stainless steel finish.
        a. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.

B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.

C. Hall Position Indicator: Not Applicable

D. Hall lanterns: Not Applicable

E. Special Equipment: Not Applicable

2.10 CONTROLER LOCATION

A. Door Jamb Mount is integrated with controller in the door jamb. Power disconnect is provided by the elevator contractor and included with the integrated assembly.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.
    1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
    2. Comply with the National Electrical Code for electrical work required during installation.

B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.

C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.

D. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.

E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.

G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.

I. Lubricate operating parts of system, including ropes, as recommended by the manufacturer.

3.03 FIELD QUALITY CONTROL

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.04 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.05 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
   1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.06 PROTECTION

A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.07 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.08 ELEVATOR SCHEDULE

A. Elevator Qty. 1
   1. Elevator Model: evolution 200
   2. Elevator Type: Gearless Traction Machine Room-Less, Passenger
   3. Rated Capacity: 5000 lbs.
   4. Rated Speed: 200 ft./min.
   5. Operation System: TAC32T
   6. Travel: 86'-8"
   7. Landings: 11 total
   8. Openings:
      a. Front: 11
      b. Rear: 0
   9. Clear Car Inside: 5'-8" wide x 8'-5" deep
   10. Inside clear height: 7'-4" standard
   11. Door clear height: 7'-0" standard
   12. Hoistway Entrance Size: 4'-6" wide x 7'-0" high
   13. Door Type: Two-speed | RH Side opening
   14. Power Characteristics: 460 volts, 3 Phase, 60 Hz.

a. Note: Isolation Transformer required for jobs with less than 480vac, 3 Phase building power.

15. Seismic Requirements: No
16. Hoistway Dimensions: 8'-3" wide x 10'-2" deep
    a. Note: Hoistway dimensions listed above are for non-seismic requirements only. If you have chosen a seismic option, please consult your local TK Elevator Sales Representative for the proper hoistway dimensions.
17. Pit Depth: 5'-0"
18. Button & Fixture Style: Vandal Resistant Signal Fixtures
19. Special Operations:
    Limited Access with hall station key switches.
20. Include MAX communication. No phone line will be provided.

3.09 SPECIAL CONDITIONS (Note: Add Special Conditions as Needed)

END OF SECTION

SECTION 210000
GENERAL FIRE SUPPRESSION PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes general provisions covering the contract documents for Fire Protection Systems.

1.3 DEFINITIONS

A. Provide shall mean "Furnish, install and connect."

B. Piping shall mean "pipe installed with all specified fittings, valves and accessories, and forming a complete system."

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Electrical Coordination: In addition to submittal requirements of other Division 21 Sections, submit a document approved by the project Electrical Contractor certifying that all mechanical equipment being furnished under Division 21 complies with the electrical characteristics of the source power which will be furnished under Division 26.

C. Model numbers listed on the Mechanical Contract Documents shall not be construed to indicate electrical characteristics. Electrical characteristics of mechanical equipment shall be as indicated on the Electrical Contract Documents (Division 26).

D. Review of Submittals does not relieve the Contractor of any of the requirements of the Contract Documents. Failure by the Engineer to document errors and omissions in the Contractor's submittals during the Engineer's submittal review does not constitute a waiver of any of the requirements of the original Contract Documents.

1.5 CONTRACTOR QUALIFICATIONS

A. Fire Protection System installer qualifications shall be specified in other sections of Division 21.

1.6 PRIOR APPROVALS

A. Manufacturers References: When reference is made in the Contract Documents to trade names or specific manufacturers and/or models, such reference, unless noted otherwise, is made to designate and identify the quality of materials or equipment to be furnished and is not intended to restrict competitive bidding. If it is desired to use materials or equipment different from those indicated on the Contract Documents, written request for approval must reach the hands of the Design Professional at least TEN DAYS prior to the date set for the opening of bids. A copy of the request should also be sent directly to the Engineer. Requests for prior approval of a proposed substitute shall be accompanied by complete technical data supporting the request.

B. Request for Prior Approval by facsimile transmission (fax) or email will not be considered. Prior approval requests shall be submitted in hard copy format only.

1.7 LAYOUT AND COORDINATION

A. Layout Basis:

1. The equipment listed on the Drawings and in the Specifications has been used for the physical arrangement of the mechanical systems. When equipment listed as acceptable, equal or equipment which has received "prior approval" is used, it shall be the Contractor's responsibility to provide structural, electrical, service clearances, or other changes required to accommodate the substituted equipment. Changes shall be made at no additional cost to the Owner. Submit a list of required changes along with all prior approval requests and shop drawing submittals.

2. The Contract Drawings are intended to show the general arrangement of all mechanical work. They do not show in detail all offsets, fittings and transitions. Examine Drawings, investigate site conditions to be encountered and arrange work accordingly. Furnish all offsets and transitions required.

3. Drawings do not indicate in detail exact configuration of connections for fixtures, equipment and accessories. Final connection shall be as shown on approved Manufacturer's Submittal Drawings. Where Manufacturer's Submittal Drawings conflict with the Contract Documents, confer with the Design Professional for resolution.

4. Measurement of Drawings by scale shall not be used as dimensions for fabrication. Measurements for locating fixtures, equipment, ductwork, piping and other mechanical items shall be made on the site and shall be based on actual job conditions.

5. Check space limitations and verify electrical requirements before ordering any mechanical equipment or materials. Place large equipment inside the building prior to the erection of exterior walls where equipment cannot enter finished building openings.

B. Coordination: Mechanical work shall be coordinated with that of other trades to avoid conflict. The Contractor shall study all plans and specifications for this project and shall notify the Design Professional of any conflict between work under Division 21 and work under other divisions of the Project. Particular attention shall be given to interference between piping, electrical installations, structural systems, building openings and ductwork.

C. Installation Instructions: Two binders containing manufacturer's installation instructions for all equipment furnished under Division 21 shall be furnished by the Contractor. One binder shall be kept in the General Contractor's office at the job site. The other binder shall be delivered to the Engineer upon acceptance by the Design Professional of the Submittals.

D. Operation and Maintenance Instructions: Three copies of equipment O&M manuals contained in rigid 3-ring binders shall be submitted to the Owner a minimum of 15 days prior to equipment/systems training. Binders shall have permanent labels on the spine and front cover indicating project name, project number, building name and contents. Model and serial numbers of equipment shall be shown on the cover of their respective O&M manual(s).

1.8 PERMITS

A. Obtain all necessary Permits and Inspections required for the installation of this work and pay all charges incident thereto. Deliver to the Design Professional all certificates of inspection issued by authorities having jurisdiction.

1.9 SAFETY

A. OSHA Requirements applicable to the project shall be complied with at all times.

B. Manufacturer's Safety Instructions shall be followed in all instances.

C. Asbestos Containing Materials (ACM) shall not be used on this project.

D. Electrical Equipment Clearances: Piping, equipment and other mechanical installations shall not be located within 42" of the front or 36" of the side of any electrical switchboards, panelboards, power panels, motor control centers, electrical transformers or similar electrical equipment. Piping and ductwork shall not pass through or above electrical equipment rooms except as required to serve those rooms.

E. Guards shall be provided where appliances, equipment, fans or other components that require service are located within 10 feet of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches above the floor, roof or grade below. The guard shall extend not less than 30 inches beyond each end of such appliances, equipment, fans, components and roof hatch openings and the top of the guard shall be located not less than 42 inches above the elevated surface adjacent to the guard. The guard shall be constructed so as to prevent the passage of a 21 inch diameter sphere and shall comply with the loading requirements for guards specified in the International Building Code.

1.10 PROTECTION OF FIRE SUPPRESSION SYSTEMS DURING CONSTRUCTION

A. Material storage:

1. All materials and equipment stored on the jobsite shall be elevated above the ground and stored under suitable weather cover. Materials and equipment shall not be situated in areas subjected to localized flooding.

2. Manufacturer’s original shipping packaging and protective coverings shall be left in place until the equipment is prepared for installation.

B. Electrical enclosure protection:

1. During construction, all protective covers and other devices shall be left in place that protect against inadvertent contact with live electrical circuits.

2. All warning labels related to electrical and rotating equipment hazards shall be in place prior to energizing mechanical equipment circuits.

C. Protection of Equipment and piping:

1. Maintain temporary closures on the ends of all equipment and pipes as the installation work progresses. Temporary closures include plastic sheeting, tape and appropriate caps and covers.

2. Where debris enters piping during installation, steps shall be taken to clean the interior of the pipe prior to placing in service.

3. Where debris enters equipment during installation the equipment interior shall be cleaned prior to placing in service.

1.11 CODES AND STANDARDS

A. Mechanical installations shall conform to the current edition (recognized by the State) of the following, in addition to any previously mentioned Codes and Standards.

1. The International Building Code.

2. The International Mechanical Code.

3. The International Plumbing Code.

4. The International Fire Protection Code.

5. NFPA Standard 13, Installation of Sprinkler Systems.

6. NFPA Standard 70, National Electric Code.

7. NFPA Standard 101, Code for Safety to Life for Fire in Buildings and Structures.

8. The FGI Guidelines for Design and Construction of Hospital and Healthcare Facilities.

9. NFPA 14 Standard for the installation of standpipe and hose stations.

1.12 ASBESTOS MATERIALS

A. Contractor is advised there may be **ASBESTOS PRODUCTS** in building(s) which will affect work under this Project. Particular reference is made to piping, equipment and other items that may be modified or removed. It shall be the sole responsibility of Contractor to check for and ascertain presence of asbestos materials where such presence affects work under this Project. Where Contractor ascertains presence of asbestos materials, he shall notify Owner and Engineer in writing of presence of asbestos **BEFORE** beginning any work. Removal of asbestos products shall be the responsibility of Owner **AFTER** he has been notified by Contractor of its presence.

B. Engineer assumes no responsibility of investigating for presence of **ASBESTOS PRODUCTS** or for verifying presence of asbestos materials, nor does Engineer assume any responsibility for specifying, advising on, or supervising removal of any asbestos products. Contractor and Owner shall hold harmless Engineer in any matters involving presence of, or removal of, asbestos products.

1.13 INTERRUPTION OF EXISTING SERVICES

A. Exercise care so as not to cut any existing utilities or services. Where an existing utility line or service line is cut it shall be repaired to "like-new" condition. Interruption of service shall not be made without prior written permission of the Owner.

B. Fire suppression system must remain in service during construction. Arrange with the Owner well in advance of shutdowns required for tie-ins. Shutdowns shall be made after normal occupancy hours if so directed by the Owner. No additional monies will be paid for after-hours shutdowns.

PART 2 - PRODUCTS Not required for this section.

PART 3 - EXECUTION Not required for this section.

END OF SECTION 210000

SECTION 210500
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement other Division 21 Sections.

1. Piping materials and installation instructions common to most piping systems.
2. Equipment nameplate data requirements.
3. Field-fabricated metal equipment supports.
4. Installation requirements common to equipment specification Sections.
5. Cutting and patching.
6. Touchup painting and finishing.

B. Pipe and pipe fitting materials are specified in piping system Sections.

1.3 DEFINITIONS

A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.

B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

F. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data for following piping specialties:

1. Identification materials and devices.

C. Samples of color, lettering style, and other graphic representation required for each identification material and device.

D. Shop drawings detailing fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

E. Coordination drawings for access panel and door locations.

F. Prepare coordination drawings. Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Show where sequence and coordination of installations are important to the efficient flow of the Work. Include the following:

1. Proposed locations of piping, ductwork, equipment, and materials. Include the following:

a. Planned piping layout, including valve and specialty locations and valve stem movement.

b. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.

c. Equipment service connections and support details.

d. Exterior wall and foundation penetrations.

e. Fire-rated wall and floor penetrations.

2. Scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

3. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

G. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

A. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code--Steel."

B. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.

C. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

D. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases,

and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

E. Coordinate all electrical service requirements for mechanical equipment prior to the submittal of shop drawings. Confirm the compatibility of all power services with the equipment being furnished. Confirm compatibility of electrical lugs being provided by the equipment manufacturer with the power wiring being furnished under Division 26. Furnish written documentation that all characteristics have been coordinated with and confirmed by the electrical subcontractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

E. Coordinate connection of electrical services.

F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces.

H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual piping system specification Sections in Division 21 for special joining materials not listed below.

B. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch minimum thickness, except where thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125 cast-iron and cast-bronze flanges.

b. Narrow-Face Type: For raised-face, Class 250 cast-iron and steel flanges.

2. ASME B16.20 for grooved, ring-joint, steel flanges.

3. AWWA C110, rubber, flat face, 1/8-inch thick, except where other thickness is indicated; and full-face or ring type, except where type is indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, except where other material is indicated.

D. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon steel bolts and nuts.

F. Couplings: Iron body sleeve assembly, fabricated to match outside diameters of plain-end pressure pipes.

1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47, Grade 32510 or ASTM A 536 ductile iron.

3. Gaskets: Rubber.

4. Bolts and Nuts: AWWA C111.

5. Finish: Enamel paint.

2.3 PIPING SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type where required to conceal protruding fittings and sleeves.

1. Inside Diameter: Closely fit around pipe, tube, and insulation.

2. Outside Diameter: Completely cover opening.

3. Stamped Steel: Split plate, with concealed hinge, set-screw, and chrome-plated finish.

4. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.

5. Cast-Iron Floor Plate: One-piece casting.

B. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet-Metal: 24-gage or heavier galvanized sheet metal, round tube closed with welded longitudinal joint.

2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.

3. Cast-Iron: Cast or fabricated wall pipe equivalent to ductile-iron pressure pipe, having plain ends and integral water stop, except where other features are specified.

4. Wall Penetration Systems: Wall sleeve assembly, consisting of housing, gaskets, and pipe sleeve, with 1 mechanical-joint end conforming to AWWA C110 and 1 plain pipe-sleeve end.

a. Penetrating Pipe Deflection: 5 percent without leakage.

b. Housing: Ductile-iron casting having waterstop and anchor ring, with ductile-iron gland, steel studs and nuts, and rubber gasket conforming to AWWA C111, of housing and gasket size as required to fit penetrating pipe.

c. Pipe Sleeve: AWWA C151, ductile-iron pipe.

d. Housing-to-Sleeve Gasket: Rubber or neoprene push-on type of manufacturer's design.

2.4 IDENTIFYING DEVICES AND LABELS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 21 Sections. Where more than one type is specified for listed application, selection is Installer's option, but provide single selection for each product category.

B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped, permanently fastened to equipment.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.

2. Location: An accessible and visible location.

C. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, conforming to ASME A13.1.

D. Valve Tags: Engraved aluminum painted tags on steel chain.

E. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.

1. Multiple Systems: Where multiple systems of same generic name are indicated, provide identification that indicates individual system number as well as service such "Standpipe F12."

2.5 FIRE-STOPPING

A. Fire-Resistant Sealant: Provide UL Listed firestopping system for filling openings around penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

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

1. Specified Technologies, Inc.
2. 3M Corporation
3. Metacaulk.
4. Hilti, Inc.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS--COMMON REQUIREMENTS

A. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 21 specify piping installation requirements unique to the piping system.

B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

C. Install piping at indicated slope.

D. Install components having pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's printed instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, suspended ceilings, cabinet interiors and other exposed locations, according to the following:

1. Chrome-Plated Piping: Cast-brass, one-piece, with set-screw, and polished chrome-plated finish. Use split-casting escutcheons, where required, for existing piping.

2. Uninsulated Piping Wall Escutcheons: Cast-brass or stamped-steel, with set-screw.

3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.

4. Insulated Piping: Cast-brass or stamped-steel, with concealed hinge, spring clips, and chrome-plated finish.

5. Piping in Utility Areas: Cast-brass or stamped-steel, with set-screw or spring clips.

N. Install sleeves for pipes passing through concrete and masonry walls, concrete floor and roof slabs, exterior walls and where indicated.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring where specified.

2. Build sleeves into new walls and slabs as work progresses.

3. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than 6 inches.

b. Steel Sheet-Metal Sleeves: For pipes 6 inches and larger that penetrate gypsum-board partitions.

4. Seal annular space between sleeve and pipe or pipe insulation in non-rated floors and partitions, using elastomeric joint sealants. EXCEPTION: Fire rated partition penetrations shall be sealed with U.L. Listed firestopping systems.

O. Above Grade, Exterior Wall, Pipe Penetrations: Seal penetrations using sleeves and elastomeric sealant. Size sleeve for ½-inch annular clear space between pipe and sleeve for installation of sealant.

1. Install steel pipe for sleeves smaller than 6 inches.

2. Install sheet metal sleeve assembly for sleeves 6 inches and larger.

3. Install material sleeves according to manufacturer's preprinted instructions.

P. Below Grade, Exterior Wall, Pipe Penetrations: Install ductile-iron wall penetration system sleeves according to manufacturer's printed installation instructions.

Q. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with U.L. Listed firestopping sealant system.

R. Verify final equipment locations for roughing in.

S. Refer to equipment specifications in other Sections for roughing-in requirements.

T. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system Sections.

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

3. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter. Join pipe fittings and valves as follows:

a. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.

b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).

c. Align threads at point of assembly.

d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.

e. Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

4. Welded Joints: Construct joints according to AWS D10.12 "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe" using qualified processes and welding operators according to the "Quality Assurance" Article.

5. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

U. Piping Connections: Except as otherwise indicated, make piping connections as specified below.

1. Install unions in piping 2 inches and smaller adjacent to each valve and at final connection to each piece of equipment having a 2-inch or smaller threaded pipe connection.

2. Install flanges in piping 2-1/2 inches and larger adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.

3. Install dielectric unions and flanges to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION--COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Design Professional.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.

D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

E. Install equipment giving right-of-way to piping systems installed at a required slope.

3.3 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Plastic markers, with application systems.

2. Locate pipe markers wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums), and exposed exterior locations as follows:

a. Near each valve and control device.

b. Near locations where pipes pass through walls, floors, ceilings, or enter inaccessible enclosures.

c. At access doors, manholes, and similar access points that permit view of concealed piping.

d. Near major equipment items and other points of origination and termination.

e. Spaced at a maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.

f. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

B. Valves: Provide tags on all valves provided under the project.

C. Equipment: Install engraved sign or equipment marker on or near each major item of mechanical equipment.

1. Lettering Size: Minimum 1/4-inch -high lettering for name of unit where viewing distance is less than 2 feet, 1/2-inch -high for distances up to 6 feet, and proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.

2. Text of Signs: Provide text to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to name of identified unit.

3.4 PAINTING AND FINISHING

A. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

B. Paint all exposed steel surfaces of piping and supports with one coat of primer and two coats of enamel.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1 "Structural Welding Code--Steel."

3.6 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of the trades involved.

B. Repair cut surfaces to match adjacent surfaces.

END OF SECTION 210500

SECTION 210519
GAGES FOR FIRE PROTECTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes gages used in fire protection systems.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data for each type of gage and fitting specified. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit a meter and gage schedule showing manufacturer's figure number, scale range, location, and accessories for each meter and gage.

C. Product certificates signed by manufacturers of meters and gages certifying accuracies under specified operating conditions and compliance with specified requirements.

1.4 QUALITY ASSURANCE

A. Comply with applicable portions of American Society of Mechanical Engineers (ASME) and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gages.

B. Design Criteria: The Drawings indicate types, sizes, capacities, ranges, profiles, connections, and dimensional requirements of meters and gages and are based on the specific manufacturer types and models indicated. Meters and gages having equal performance characteristics by other manufacturers may be considered, provided that deviations do not change the design concept or intended performance as judged by the Design Professional. The burden of proof for equality of meters and gages is on the proposer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Pressure Gages:

a. AMETEK, U.S. Gauge Div.
b. Ashcroft by Dresser Industries, Instrument Div.
c. Marsh Instrument Co.
d. Marshalltown Instruments, Inc.

e. H.O. Trerice Co.
f. Weiss Instruments, Inc.
g. Weksler Instruments Corp.
h. WIKA Instruments Corp.

2.2 PRESSURE GAGES

A. Description: ASME B40.1, Grade A phosphor-bronze Bourdon-tube pressure gage, with bottom connection.

B. Case: Drawn steel, brass, or aluminum with 4-1/2-inch -diameter glass lens.

C. Connector: Brass, 1/4-inch.

D. Scale: White-coated aluminum, with permanently etched markings.

E. Accuracy: Plus or minus 1 percent of range span.

F. Range: Conform to the following:
1. Fluids Under Pressure: 2 times operating pressure.

2.3 PRESSURE-GAGE ACCESSORIES

A. Snubbers: 1/4-inch brass bushing with corrosion-resistant porous-metal disc of material suitable for system fluid and working pressure.

PART 3 - EXECUTION

3.1 GAGE APPLICATIONS

A. General: Where indicated, install meters and gages of types, sizes, capacities, and with features indicated.

3.2 GAGE INSTALLATION, GENERAL

A. Install gages and accessories according to manufacturers' written instructions for applications where used.

3.3 PRESSURE GAGE INSTALLATION

A. Install pressure gages in piping tee with pressure gage valve located on pipe at most readable position. Install in locations indicated on the drawings.

B. Install in the following locations and elsewhere as indicated:

1. At building water service entrance.

2. At floor control valves.

C. Pressure Gage Needle Valves: Install in piping tee with snubber. Install syphon instead of snubber for steam pressure gages.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 21 Sections. The Drawings indicate the general arrangement of piping, fittings, and specialties.

B. Install gages adjacent to machines and equipment to allow servicing and maintenance.

3.5 ADJUSTING AND CLEANING

A. Adjusting: Adjust faces of gages to proper angle for best visibility.

B. Cleaning: Clean windows of gages and factory-finished surfaces. Replace cracked and broken windows and repair scratched and marred surfaces with manufacturer's touchup paint.

END OF SECTION 210519

SECTION 210523
GENERAL DUTY VALVES FOR FIRE PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes general duty valves common to several mechanical piping systems.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data for each valve type. Include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application.

C. Maintenance data for valves to include in the operation and maintenance manual. Include detailed manufacturer's instructions on adjusting, servicing, disassembling, and repairing.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.

1. ASME B1.20.1 for threads for threaded end valves.

2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

3. ASME B31.9 for building services piping valves.

4. AWWA C606 for grooved end connections.

B. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

C. Bronze and brass valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted unless the alloy is heat treated.

D. MSS Compliance: Comply with the various MSS Standard Practice documents referenced.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, grooves, and weld ends.

3. Set ball valves open to minimize exposure of functional surfaces.

4. Block check valves in either closed or open position.

PART 2 - PRODUCTS

2.1 BASIC, COMMON FEATURES

A. Pressure and Temperature Ratings: As indicated in the "Application Schedule" of Part 3 of this Section and as required to suit system pressures and temperatures.

B. Sizes: Same size as upstream pipe, unless otherwise indicated. All valves shall be a full port design.

C. Valve Actuator Types:

1. Hand lever: For quarter-turn valves smaller than NPS 4 (DN 100).

D. Threads: ASME B1.20.1.

E. Flanges: ASME B16.1 for cast iron, ASME B16.5 for steel, and ASME B16.24 for bronze valves.

F. Grooved End Couplings: Valves with grooved ends may used in grooved piping applications.

2.2 BALL VALVES

A. Brass Ball Valves, Two-Piece with Full Port and Stainless Steel Trim, Threaded or Soldered Ends:

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

a. American Valve, Inc.
b. Apollo Flow Controls; Conbraco Industries, Inc.
c. Hammond Valve.
d. Jomar Valve.
e. Legend Valve & Fitting, Inc.
f. NIBCO INC.

2. Description:

a. Standard: MSS SP-110 or MSS SP-145.

b. CWP Rating: 600 psig (4140 kPa).

c. Body Design: Two piece.

d. Body Material: Heat treated forged brass.

e. Ends: Threaded and soldered.

f. Seats: PTFE.

g. Stem: Stainless steel.

h. Ball: Stainless steel.

i. Port: Full.

B. Brass Ball Valves, Two-Piece with Full Port and Stainless Steel Trim, Press-Fit Ends:

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

a. American Valve, Inc.
b. Apollo Flow Controls; Conbraco Industries, Inc.
c. Hammond Valve.
d. Jomar Valve.
e. Legend Valve & Fitting, Inc.
f. NIBCO INC.

2. Description:

a. Standard: MSS SP-110 or MSS SP-145.

b. CWP Rating: Minimum 250 psig (1724 kPa).

c. Body Design: Two piece.

d. Body Material: Heat treated forged brass.

e. Ends: Press-fit.

f. Press Ends Connections Rating: Minimum 250 psig (1724 kPa).

g. Seats: PTFE or RPTFE.

h. Stem: Stainless Steel.

i. Ball: Stainless Steel.

j. Port: Full.

k. O-Ring Seal: Buna-N or EPDM.

2.3 CHECK VALVES

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

1. Manufacturers:

a. American Valve, Inc.
b. Apollo Flow Controls; Conbraco Industries, Inc.
c. Crane; Crane Energy Flow Solutions.
d. Hammond Valve.
e. Jomar Valve.

f. Legend Valve & Fitting, Inc.
g. Milwaukee Valve Company.
h. NIBCO INC.

B. Swing Check Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi CWP, or Class 150, 300-psi CWP; horizontal swing, Y-pattern, ASTM B 62 cast-bronze body and cap, rotating bronze disc with rubber seat or composition seat, threaded or soldered end connections:

C. Swing Check Valves, 3 Inches and Larger: MSS SP-71, Class 125, 200-psi CWP, ASTM A 126 cast-iron body and bolted cap, horizontal-swing bronze disc, flanged or grooved end connections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION

A. Install valves as indicated, according to manufacturer's written instructions.

B. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.

C. Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.

D. Locate valves for easy access and provide separate support where necessary.

E. Install valves in horizontal piping with stem at or above the center of the pipe.

F. Install valves in a position to allow full stem movement.

G. Installation of Check Valves: Install for proper direction of flow as follows:

1. Swing Check Valves: Horizontal position with hinge pin level.

3.3 ADJUSTING

A. Adjust or replace packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if leak persists.

END OF SECTION 220523

SECTION 210529
HANGERS AND SUPPORTS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes hangers and supports for fire suppression piping and equipment.

1.3 DEFINITIONS

A. Terminology used in this Section is defined in MSS SP-90.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data for each type of hanger and support.

C. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

E. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.

1.5 QUALITY ASSURANCE

A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code--Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

C. NFPA Compliance: Comply with NFPA 13 for hangers and supports used as components of fire protection systems.

D. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.

1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.

E. Licensed Operators: Use operators that are licensed by powder-operated tool manufacturers to operate their tools and fasteners.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.

1. Components include galvanized coatings or alternate rust preventing shop coating.

2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

B. Thermal-Hanger Shield Inserts: 100-psi average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.

C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

2.2 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36, steel plates, shapes, and bars, black and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.

C. Washers: ASTM F 844, steel, plain, flat washers.

D. Grout: ASTM C 1107, Grade B, non-shrink, nonmetallic.

1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is non-staining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.

3. Water: Potable.

4. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in the Section specifying the equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 HANGER AND SUPPORT INSTALLATION

A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.

C. Install supports with maximum spacings complying with MSS SP-69.

D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.

F. Install concrete inserts in new construction prior to placing concrete.

G. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

H. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

K. Support all piping direct from structure and independent of other piping.

L. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

M. Load Distribution: Install hangers and supports so that piping live and dead loading and stress from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.

3.4 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.

B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedure(s) for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without under-cut or overlap.

3. Remove welding flux immediately.

4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

C. Paint all exposed steel surfaces with one coat of primer and two coats of enamel.

END OF SECTION 210529

SECTION 210560
FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes fire-suppression piping and equipment for the following building systems:

1. Automatic wet-type, Class I, fire-suppression standpipes and branches for sprinklers.

2. Wet-pipe, fire-suppression sprinklers, including piping, valves, specialties, and automatic sprinklers.

1.3 DEFINITIONS

A. Hose Connection: Valve with threaded outlet matching fire hose coupling thread for attaching fire hose.

B. Working Plans: Documents, including drawings, calculations, and material specifications prepared according to NFPA 13 and NFPA 14 for obtaining approval from authorities having jurisdiction.

C. Q.R.: Quick response.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. Design standpipes and sprinklers and obtain approval from authorities having jurisdiction.

B. Design standpipes and obtain approval from authorities having jurisdiction. Include minimum residual pressures at hydraulically remote outlets according to the following:

1. NPS 2-1/2 Hose Connections: 100 psig.

C. Design sprinkler piping according to the following and obtain approval from authorities having jurisdiction:

1. Include 10 psi margin of safety for available water pressure.

2. Include losses through water-service piping, valves, and backflow preventers.

3. Sprinkler Occupancy Hazard Classifications: As follows:

a. Building Service Areas: Ordinary Hazard, Group 1.

b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.

c. General Storage Areas: Ordinary Hazard, Group 1.

d. Library Areas: Ordinary Hazard, Group 1.

e. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.

f. Office and Public Areas: Light Hazard.

g. Residential Living Areas: Light Hazard.

h. Kitchen Service Areas: Ordinary Hazard, Group 1.

4. Minimum Density for Automatic-Sprinkler Piping Design: As follows:

a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area. Area may be reduced as permitted by NFPA 13.

b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500- sq. ft. area. Area may be reduced as permitted by NFPA 13.

D. Components and Installation: Capable of producing piping systems with 175-psigminimum working-pressure rating, unless otherwise indicated.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Pipe and fitting materials and methods of joining for standpipe piping.

2. Pipe and fitting materials and methods of joining for sprinkler piping.

3. Pipe hangers and supports.

4. Valves, including specialty valves, accessories, and devices.

5. Alarm devices. Include electrical data.

6. Fire department connections. Include type; number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish.

7. Hose connections. Include size, type, and finish.

8. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.

B. Fire-Hydrant Flow Test Report: As specified in "Preparation" Article.

C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction. Include hydraulic calculations, if applicable.

D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13 and NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping."

E. Maintenance Data: For each type of standpipe and sprinkler specialty to include in maintenance manual.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has designed and installed fire-suppression piping similar to that indicated for this Project and obtained design approval and inspection approval from authorities having jurisdiction.

B. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL's "Fire Protection Equipment Directory" and FM's "Fire Protection Approval Guide" and that comply with other requirements indicated.

C. Standpipe and Sprinkler Components: Listing/approval stamp, label, or other marking by a testing agency acceptable to authorities having jurisdiction.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

E. NFPA Standards: Equipment, specialties, accessories, installation, and testing complying with the following:

1. NFPA 13, "Installation of Sprinkler Systems."

2. NFPA 14, "Standpipe and Hose Systems."

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounting steel cabinet and hinged cover, with space for a minimum of six spare sprinklers plus sprinkler wrench. Include the number of sprinklers required by NFPA 13 and wrench for sprinklers. Include separate cabinet with sprinklers and wrench for each type of sprinkler on Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. Specialty Valves and Devices:

a. Anvil International
b. Globe Fire Sprinkler Corp.
c. Reliable Automatic Sprinkler Co., Inc.
d. Viking Corp.
e. Tyco

2. Water-Flow Indicators and Supervisory Switches:

    a. Anvil International
    b. Gamewell Co.
    c. System Sensor Div.
    d. Potter Electric Signal Co.
    e. Reliable Automatic Sprinkler Co., Inc.
    f. Viking Corp.

3. Sprinkler, Drain and Alarm Test Fittings:

    a. AGF Manufacturing
    b. Globe Fire Sprinkler Corp.
    c. Reliable
    d. Smith-Cooper International; FPPI Div.
    e. Viking Corp.

4. Sprinkler, Inspector's Test Fittings:

    a. AGF Manufacturing
    b. Globe Fire Sprinkler Corp.
    c. Reliable
    d. Smith-Cooper International; FPPI Div.
    e. Viking Corp.

5. Electrically Operated Alarm Bell:

    a. Fire Lite Alarms, Inc.; a Honeywell company
    b. Notifier, a Honeywell company
    c. Potter Electric Signal Company

6. Fire Department Connections:

    a. Anvil International
    b. Elkhart Brass Mfg. Co., Inc.
    c. Fire-End and Croker Corp.
    d. Guardian Fire Equipment, Inc.
    e. Potter-Roemer Div.
    f. Reliable Automatic Sprinkler Co., Inc.
    g. Smith-Cooper International; FPPI Div.

7. Sprinklers:

    a. Globe Fire Sprinkler Corp.
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Viking Corp.
    d. Tyco

8. Hose Connections and Hose Stations:

    a. Elkhart Brass Mfg. Co., Inc.
    b. Guardian Fire Equipment, Inc.
    c. Potter-Roemer Div.
    d. Tyco

9. Indicator Posts and Indicator-Post, Gate Valves:

    a. Anvil International
    b. Kennedy Valve Div.
    c. Mueller
    d. Nibco, Inc.
    e. Stockham Valves & Fittings, Inc.
    f. Victaulic Co. of America

10. Indicator Valves:

    a. Anvil International
    b. Kennedy Valve Div.
    c. Mueller
    d. Nibco, Inc.
    e. Stockham Valves & Fittings, Inc.
    f. Victaulic Co. of America

11. Fire-Protection-Service Valves:

    a. Anvil International
    b. Grinnell.
    c. Mueller
    d. Nibco, Inc.
    e. Stockham Valves & Fittings, Inc.
    f. Victaulic Co. of America

12. Keyed Couplings for Steel Piping:

    a. Anvil International
    b. Grinnell
    c. Gruvlok
    d. Star Pipe Products, Inc.
    e. Victaulic Co. of America.

13. Keyed Couplings for Ductile-Iron Piping:

    a. Anvil International
    b. Gruvlok
    c. Victaulic Co. of America.

14. Backflow Preventers:

    a. Ames Co., Inc.
    b. Febco Div.
    c. Conbraco Industries, Inc.
    d. Watts Industries, Inc.
    e. Zurn Industries, Inc.; Wilkins Div.

15. Automatic Air Venting Device:

    a. AGF Manufacturing
    b. Globe Fire Sprinkler Corp.
    c. Potter Signal
    d. Reliable
    e. Viking Corp

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 PIPES AND TUBES

A. Standard-Weight Steel Pipe: ASTM A 53, ASTM A 135, or ASTM A 795; Schedule 40 in NPS 2 (DN150) and smaller.

B. Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 2-1/2 and larger.

C. Stainless Steel Tubing: UL listed, one-piece flexible tubing system. System assembly shall include couplings and ceiling grid mounting hardware; piping assembly shall be designed for connecting branch piping to sprinklers and mounting sprinklers in ceiling.

2.4 PIPE AND TUBE FITTINGS

A. Cast-Iron Threaded Flanges: ASME B16.1.

B. Cast-Iron Threaded Fittings: ASME B16.4.

C. Malleable-Iron Threaded Fittings: ASME B16.3.

D. Steel, Threaded Couplings: ASTM A 865.

E. Steel Welding Fittings: ASTM A 234/A 234M, ASME B16.9, or ASME B16.11.

F. Steel Flanges and Flanged Fittings: ASME B16.5.

G. Steel, Grooved-End Fittings: UL-listed and FM-approved, ASTM A 47 (ASTM A 47M), malleable iron or ASTM A 536, ductile iron; with dimensions matching steel pipe and ends factory grooved according to AWWA C606.

2.5 JOINING MATERIALS

A. Refer to other Division 21 sections for pipe-flange gasket materials and welding filler metals.

B. Ductile-Iron, Keyed Couplings: UL 213 and AWWA C606, for ductile-iron pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gaskets, and steel bolts and nuts.

C. Ductile-Iron, Flanged Joints: AWWA C115, ductile-iron or gray-iron pipe flanges, rubber gaskets, and steel bolts and nuts.

D. Steel, Keyed Couplings: UL 213 and AWWA C606, for steel-pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gaskets, and steel bolts and nuts

E. Transition Couplings: AWWA C219, sleeve type, or other manufactured fitting the same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

2.6 GENERAL-DUTY VALVES

A. Refer to other Division 21 sections for gate, ball, butterfly, globe, and check valves not required to be UL listed and FM approved.

2.7 FIRE-PROTECTION-SERVICE VALVES

A. General: UL Listed and FM approved, with minimum 175-psig non-shock working-pressure rating. Valves for grooved-end piping may be furnished with grooved ends instead of type of ends specified.

B. Gate Valves, NPS 2 and Smaller: UL 262; cast-bronze, threaded ends; solid wedge; OS&Y; and rising stem.

1. Indicator: Electrical, prewired, supervisory switch. Coordinate requirements with fire alarm system.

C. Indicating Valves, NPS 2-1/2 and Smaller: UL 1091; butterfly or ball-type, bronze body with threaded ends; and integral indicating device.

1. Indicator: Electrical, prewired, supervisory switch. Coordinate requirements with fire alarm system.

D. Gate Valves, NPS 2-1/2 and Larger: UL 262, iron body, bronze mounted, taper wedge, OS&Y, and rising stem. Include replaceable, bronze, wedge facing rings and flanged ends.

1. Indicator: Electrical, prewired, supervisory switch. Coordinate requirements with fire alarm system.

E. Swing Check Valves, NPS 2 and Smaller: UL 312 or MSS SP-80, Class 150; bronze body with bronze disc and threaded ends.

F. Swing Check Valves, NPS 2-1/2 and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze-disc ring and flanged ends.

2.8 SPECIALTY VALVES

A. Alarm Check Valves: UL 193, 175-psig working pressure; designed for horizontal or vertical installation, with cast-iron flanged inlet and outlet, bronze grooved seat with O-ring seals, and single-hinge pin and latch design. Include trim sets for bypass, drain, electric sprinkler alarm switch and pressure gages.

1. Option: Grooved-end connections for use with keyed couplings.

2. Alarm valves with integral inspector test, drain and pressure relief assemblies are acceptable.

B. Ball Drip Valves: UL 1726, automatic drain valve, NPS 3/4 (DN20), ball check device with threaded ends.

2.9 SPRINKLERS

A. Automatic Sprinklers: With heat-responsive element complying with UL199.

B. Sprinkler Types and Categories: Nominal 1/2-inch orifice for "Intermediate" temperature classification rating, unless otherwise indicated or required by application.

C. Sprinkler types, features, and options include the following:

1. Quick-response sprinklers.

2. Recessed sprinklers, including escutcheon.

3. Sidewall sprinklers.

4. Sidewall, dry-type sprinklers.

5. Upright sprinklers.

D. Sprinkler Finishes: Bronze and painted.

E. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Steel, white finish, one piece, flat.

2. Sidewall Mounting: Steel, white finish, one piece, flat.

F. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

2.10 SPECIALTY SPRINKLER FITTINGS

A. Specialty Fittings: UL Listed and FM approved; made of steel, ductile iron, or other materials compatible with piping.

B. Mechanical-T Fittings: UL 213, ductile-iron housing with pressure-responsive gasket, bolts, and threaded or locking-lug outlet.

C. Mechanical-Cross Fittings: UL 213, ductile-iron housing with pressure-responsive gaskets, bolts, and threaded or locking-lug outlets.

D. Drop-Nipple Fittings: UL 1474, with threaded inlet, threaded outlet, and seals; adjustable.

E. Sprinkler, Inspector's Test Fittings: UL-listed, cast- or ductile-iron housing; with threaded inlet and drain outlet and sight glass.

2.11 SPRINKLER INSPECTOR'S TEST FITTINGS WITH INTEGRAL PRESSURE RELIEF AND DRAIN

A. Standard: UL or FM Global, listing. NFPA 13.

B. Pressure Rating: 300 psig.

C. Body Material: Bronze body, brass stem, steel handle, chrome-plated bronze ball, virgin teflon valve seat.

D. Sight Glass: Bronze housing with viewing window.

E. Components: A tamper resistant test orifice and a tapped port for system access.

F. Pressure Relief Valve and Drainage Piping:

1. Body Material: Bronze body and stainless-steel spring.

2. Components: Nylobraid flexible tube, One 1/2 inch NPT by barbed 90 degree elbow, one ½" NPT by barbed straight adapter, external identification plate and integral flushing handle to remove debris

3. ½-inch MIPT inlet, ½-inch FIPT outlet.

4. Relief pressure shall be factory set to project specifications.

5. Relief valve shall operate to the OPEN position between 90% and 105% of the set pressure.

6. Relief valve shall reseat or CLOSE at a minimum of 80% of set pressure.

G. Size: F.I.P.T., same as connected piping.

H. Inlet and Outlet: Threaded.

2.12 HOSE CONNECTIONS

A. Description: UL 668, 300-psig minimum pressure rating, brass, hose valve for connecting fire hose. Include 90-degree angle pattern design; female NPS inlet and male hose outlet; and lugged cap, gasket, and chain. Include NPS NPS 2-1/2 as indicated, and hose valve threads according to NFPA 1963 and matching local fire department threads.

1. Valve Operation: Nonadjustable type unless pressure-regulating type is required.

2. Finish: Rough brass.

3. Finish: Rough chrome plated.

2.13 FIRE DEPARTMENT CONNECTIONS

A. Wall, Fire Department Connections: UL 405; cast-brass body with brass, wall, escutcheon plate; brass, lugged caps with gaskets and brass chains; and brass, lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking "AUTO SPKR & STANDPIPE."

1. Type: Exposed, projecting mounting.

2. Escutcheon Plate: Round.

3. Finish: Polished brass.

2.14 ALARM DEVICES

A. General: Types matching piping and equipment connections.

B. Electrically Operated Alarm Bell:

1. Standard: UL464

2. Type: Vibrating, metal alarm bell.

3. Size: 6-inch minimum diameter.

4. Finish: Red-enamel factory finish, suitable for outdoor use.

C. Water-Flow Indicators: UL 346; electrical-supervision, vane-type water-flow detector; with 250-psig pressure rating; and designed for horizontal or vertical installation. Include two single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

D. Pressure Switches: UL 753; electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.

E. Valve Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

F. Indicator-Post Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled indicator-post valve is in other than fully open position.

2.15 PRESSURE GAGES

A. Pressure Gages: UL 393, 3-1/2- to 4-1/2-inch diameter dial with dial range of 0 to 250 psig.

2.16 BACKFLOW PREVENTERS

A. General: ASSE standard, backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.

1. 2-inch NPS and Smaller: Bronze body with threaded ends.

2. 2½-inch NPS and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.

B. Double-Check Detector Assembly Backflow Preventers: ASSE 1048, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; 2 positive-seating check valves; and bypass with displacement-type water meter, valves and double-check backflow preventer.

2.17 AIR VENTING DEVICE

A. Product: Device which automatically vents air from wet pipe sprinkler system.

1. Standard: UL or FM Global, listing. NFPA 13.

2. Pressure Rating: 300 psig, 175 psi for air vent.

3. Body Material: Forged brass body.

4. Components: Ball valve, stainless steel strainer, purge valve with hose connection, thread cap with lanyard, automatic air vent.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article in Part 1 of this Section.

B. Report test results promptly and in writing.

3.2 EXAMINATION

A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PIPING APPLICATIONS

A. Do not use welded joints with galvanized steel pipe.

B. Flanges, unions, and transition and special fittings with pressure ratings the same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.

C. Piping between Fire Department Connections and Check Valves: Use galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.

D. Piping between Fire Department Connections and Check Valves: Use galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.

E. Standpipes: Use the following:

1. NPS 10 and Smaller: Schedule 10 steel pipe with roll-grooved ends; steel, grooved-end fittings; and grooved joints.

2. NPS 10 and Smaller: Schedule 10 steel pipe with plain ends, steel welding fittings, and welded joints.

F. Wet-Pipe Sprinklers: Use the following:

1. NPS 2 and Smaller: Standard-weight steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.

2. NPS 1-1/4 and larger: Schedule 10 steel pipe with roll-grooved ends; steel, grooved-end fittings; and grooved joints.

3. NPS 1-1/4 and larger: Schedule 10 steel pipe with plain ends, steel welding fittings, and welded joints.

3.4 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Fire-Protection-Service Valves: UL Listed and FM approved for applications where required by NFPA 13 and NFPA 14.

a. Shutoff Duty: Use gate valves.

2. General-Duty Valves: For applications where UL-listed and FM-approved valves are not required by NFPA 13 and NFPA 14.

a. Shutoff Duty: Use gate, ball, or butterfly valves.

b. Throttling Duty: Use globe, ball, or butterfly valves.

3.5 JOINT CONSTRUCTION

A. Refer to other Division 21 sections for basic piping joint construction.

B. Steel-Piping, Grooved Joints: Use Schedule 40 steel pipe with cut or roll-grooved ends and Schedule 30 or thinner steel pipe with roll-grooved ends; steel, grooved-end fittings; and steel, keyed couplings. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.

C. Dissimilar-Piping-Material Joints: Construct joints using adapters or couplings compatible with both piping materials. Use dielectric fittings if both piping materials are metal. Refer to other Division 21 sections for dielectric fittings.

3.6 WATER-SUPPLY CONNECTION

A. Connect standpipe and sprinkler piping to existing sprinkler supply piping.

3.7 PIPING INSTALLATION

A. Refer to other Division 21 sections for basic piping installation.

B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with the Design Professional before deviating from approved working plans.

C. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.

E. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections.

F. Install "Inspector's Test Connections" in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13.

G. Install sprinkler piping with drains for complete system drainage.

H. Install pressure relief valves. Route pressure relief valve outlet to system drain piping.

I. Install sprinkler zone control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install drain valves on standpipes.

K. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.

L. Install alarm devices in piping systems.

M. Hangers and Supports: Comply with NFPA 13 for hanger materials. Install according to NFPA 13 for sprinkler piping and to NFPA 14 for standpipes.

N. Install piping with grooved joints according to manufacturer's written instructions. Construct rigid piping joints, unless otherwise indicated.

O. Install flexible stainless-steel tubing systems in accordance with the manufacturer’s instructions.

P. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal and install where they will not be subject to freezing.

Q. Install backflow preventers of type, size and capacity indicated at each water-supply connection to mechanical equipment and systems, and to other equipment and water systems as indicated. Comply with authorities having jurisdiction. Locate backflow preventers in same room as connected equipment. Install air-gap fitting on units with atmospheric vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.

R. Install automatic air venting device at high point of wet pipe sprinkler systems.

3.8 SPECIALTY SPRINKLER FITTING INSTALLATION

A. Install specialty sprinkler fittings according to manufacturer's written instructions.

3.9 VALVE INSTALLATION

A. Refer to other Division 21 sections for installing general-duty valves. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13 and NFPA 14, manufacturer's written instructions, and authorities having jurisdiction.

B. Gate Valves: Install fire-protection-service valves supervised-open, located to control sources of water supply except from fire department connections. Provide permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection.

D. Install backflow preventers in each water-supply connection.

E. Alarm Check Valves: Install valves in vertical position for proper direction of flow, including bypass check valve and retard chamber drain-line connection.

3.10 SPRINKLER APPLICATIONS

A. General: Use sprinklers according to the following applications:

1. Rooms without Ceilings: Q.R. upright sprinklers.

2. Rooms with Suspended Ceilings: Q.R. recessed sprinklers.

3. Rooms with Suspended Ceilings: Q.R. concealed sprinklers.

4. Rooms with Suspended Ceilings: Q.R. recessed and concealed sprinklers, as indicated.

5. Wall Mounting: Q.R. sidewall sprinklers.

6. Spaces Subject to Freezing: Sidewall, dry-type sprinklers.

7. Special Applications: Use extended-coverage, sprinklers where indicated.

8. Sprinkler Finishes: Use sprinklers with the following finishes:

a. Upright Sprinklers: Rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

b. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.

c. Recessed Sprinklers: Bright white, with bright white escutcheon.

d. Sidewall Sprinklers: Chrome with chrome escutcheon.

3.11 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical panels and tiles.

B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space.

3.12 HOSE-CONNECTION INSTALLATION

A. Install hose connections adjacent to standpipes, unless otherwise indicated.

B. Install freestanding hose connections for access and minimum passage restriction.

C. Install NPS 2-1/2 hose connections with flow- restricting device, unless otherwise indicated.

3.13 CONNECTIONS

A. Connect water-supply piping and standpipes and sprinklers to fire pumps. Include backflow preventers.

B. Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.

C. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.

D. Electrical Connections: Power wiring is specified in Division 26.

E. Connect alarm devices to fire alarm.

3.14 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and NFPA 14 and in other Division 21 sections.

3.15 FIELD QUALITY CONTROL

A. Flush, test, and inspect sprinkler piping according to NFPA 13, "System Acceptance" Chapter.

B. Flush, test, and inspect standpipes according to NFPA 14, "Tests and Inspection" Chapter.

C. Replace piping system components that do not pass test procedures and retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.

D. Report test results promptly and in writing to the Design Professional and authorities having jurisdiction.

3.16 CLEANING

A. Clean dirt and debris from sprinklers. Where adhesive materials such as paint and drywall mud have adhered to sprinklers, they shall be replaced entirely.

B. Remove and replace sprinklers having paint other than factory finish.

3.17 PROTECTION

A. Protect sprinklers from damage until Material Completion.

3.18 COMMISSIONING

A. Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.

B. Verify that air compressors and their accessories are installed and operate correctly.

C. Verify that specified tests of piping are complete.

D. Verify that damaged sprinklers and sprinklers with paint or coating not specified are replaced with new, correct type.

E. Verify that sprinklers are correct types, have correct finishes and temperature ratings, and have guards as required for each application.

F. Verify that potable-water supplies have correct types of backflow preventers. Certify backflow preventers as required by local water authority. Provide copy of certification to Owner and to local water authority.

G. Verify that hose connections and fire department connections have threads compatible with local fire department equipment.

H. Fill wet-pipe sprinkler piping with water.

I. Fill standpipes with water.

J. Verify that hose connections are correct type and size.

K. Energize circuits to electrical equipment and devices.

L. Adjust operating controls and pressure settings.

M. Coordinate with fire alarm tests. Operate as required.

N. Coordinate with fire-pump tests. Operate as required.

3.19 DEMONSTRATION

A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.

B. Schedule demonstration with Owner with at least seven days' advance notice.

END OF SECTION 210560

SECTION 213113
ELECTRIC-DRIVE FIRE PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes electric-drive fire pumps and accessories for fire-protection service.

1.3 DEFINITIONS

A. Fire Pump: Pump used to supply water at rated capacity and total rated head required for fire-protection service.

B. Fire Pump Unit: Assembled unit consisting of fire pump, driver, controller, and accessories.

C. Horizontal Fire Pump: Vdertical-mounting, electric-drive, horizontal fire pump.

D. Pressure-Maintenance Pump: Pump used to maintain water pressure in a sprinkler system.

E. Pressure-Maintenance Pump Unit: Assembled unit consisting of pressure-maintenance pump, driver, controller, and accessories.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide fire pump systems that include fire pump units, pressure-maintenance pump units, accessories, and piping that comply with performance requirements specified and are compatible with building fire-protection systems.

B. Pump, Equipment, Accessory, and Piping Pressure Rating: 175 psig minimum, except where a higher rating is indicated.

1.5 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and other Specification Sections.

B. Product data for fire pump units and pressure pump units. Include clearly stated rated capacities of each selected model, performance curve with each selection point indicated, driver, pump controller, furnished specialties, and accessories; plus weights (shipping and installed).

C. Product certificates signed by manufacturers of fire pumps, certifying that their products comply with specified requirements.

D. Test curves of fire pump manufacturer's factory tests for each fire pump, and certificates signed by manufacturer verifying that the test results comply with specified requirements.

E. Shop drawings showing layout and connections for fire pump units and pressure-maintenance pump units. Show pumps, drivers, controllers, accessories, and piping. Include setting drawings with templates and directions for installation of foundation bolts, anchor bolts, and other anchorages.

1. Shop drawings may be incorporated into other Division 21 fire-protection piping system shop drawings.

F. Wiring diagrams detailing field-installed wiring for power, signal, and control systems.

G. Field-acceptance test data showing proper performance according to provisions specified.

H. Maintenance data for each fire pump and pressure-maintenance pump unit to include in the "Operating and Maintenance Manual".

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firms whose fire pumps, pressure-maintenance pumps, drivers, controllers, and accessories are listed by product name and manufacturer in the UL "Fire Protection Equipment Directory" and FM "Approval Guide" and that comply with requirements indicated. The following listings are not required:

1. UL listing and FM approval of pressure-maintenance pumps.

2. FM approval of pressure-maintenance pump controllers.

B. Single-Source Responsibility: Obtain fire pump units and pressure-maintenance pump units, components, and accessories from a single source. Include a source with responsibility and accountability to answer and resolve problems regarding compatibility, installation, performance, and acceptance of units.

C. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.

D. Comply with local fire department/marshal standards pertaining to material, hose threads, and installation.

E. Comply with requirements of NFPA 20 "Standard for the Installation of Centrifugal Fire Pumps" for fire pumps, drivers, controllers, accessories, and installation.

F. Comply with requirements of NFPA 70 "National Electrical Code" for electrical materials and installation.

G. Comply with requirements of FM "Approval Guide" applicable to fire pumps, drivers, controllers, and accessories, and provide system capable of FM acceptance.

H. Manufacturer's Factory Tests: Perform factory test for each fire pump.

I. Design Criteria: The Drawings indicate sizes, profiles, connections, and dimensional requirements of fire pump and pressure-maintenance pump units and are based on specific manufacturer types and models indicated. Pump units having equal performance characteristics by other manufacturers may be considered, provided that deviations in dimensions and profiles do not change the design concept or intended performance as judged by the Design Professional. The burden of proof for equality of units is on the proposer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Shipping: After assembling and testing fire pumps and pressure-maintenance pumps, clean flanges and exposed machined metal surfaces and treat with an anticorrosion compound. Protect flanges, pipe openings, and nozzles.

B. Store fire pumps, pressure-maintenance pumps, drivers, controllers, and accessories in a clean dry place.

C. Retain shipping flange protective covers and protective coatings during storage.

D. Protect bearings and couplings against damage from sand, grit, or other foreign matter.

E. Extended Storage Greater Than 5 Days: Dry internal parts with hot air or vacuum-producing device to prevent rusting. Upon drying, coat internal parts with protective liquid, such as light oil. Dismantle bearings and couplings, dry and coat with acid-free heavy oil, and then tag and store in a dry location.

F. Comply with manufacturer's rigging instructions for handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Fire Pumps:

a. Armstrong Darling, Inc.
b. Fairbanks Morse Pump Div., Colt Industries.
c. ITT A-C Pump, ITT Fluid Technology Corp.
d. Patterson Pump Co. Subsid., Gorman-Rupp Co.
e. Peerless Pump, Sterling Fluid Products, Inc.
f. Reddy-Buffaloes Pump, Inc.

2. Multistage Pressure-Maintenance Pumps:

a. Grundfos Pumps Corp.
b. ITT A-C Pump, ITT Fluid Technology Corp.
c. Patterson Pump Co. Subsid., Gorman-Rupp Co.
d. Peerless Pump, Sterling Fluid Products, Inc.
e. Taco, Inc.

3. Pump Controllers and Alarm Panels:

a. Firetrol, Inc.
b. Hubbell Industrial Controls, Inc.
c. Master Control Systems, Inc.
d. Metron, Inc.

2.2 FIRE PUMPS

A. Description: Vertically mounted, single-stage UL 448, factory-assembled and -tested, electric-drive fire pump of capacities and characteristics indicated.

B. Characteristics: Capable of furnishing not less than 150 percent of rated capacity at not less than 65 percent of total rated head. Shutoff head is limited to 120 percent of total rated head.

C. Casing Construction: Axially split case, centrifugal design; cast-iron pump casing with suction and discharge flanges machined to ASME B16.1 dimensions, and 125-psig pressure rating, except where 250-psig rated flanges are indicated.

D. Impeller Construction: Statically and dynamically balanced, of construction to match fire pump type, fabricated from cast bronze, keyed to shaft.

E. Wear Rings: Replaceable, bronze.

F. Pump Shaft and Sleeve: Steel shaft with bronze sleeve.

G. Pump Shaft Bearings: Grease-lubricated ball bearings contained in cast-iron housing.

H. Seals: Stuffing box with minimum of 4 rings of graphite-impregnated braided yarn with bronze lantern ring between center 2 graphite rings, and bronze packing gland.

I. Pump Couplings: Flexible, capable of absorbing torsional vibration and shaft misalignment, with metal coupling guard.

J. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.

K. Nameplates: Complete with capacities, characteristics, and other pertinent data.

2.3 DRIVERS

A. Description: NEMA MG 1, open drip-proof, squirrel-cage, induction motors. Include construction that complies with NFPA 20 and NFPA 70 and wiring compatible with controller used.

B. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.

C. Nameplates: Complete with motor horsepower, characteristics, and other pertinent data.

2.4 CONTROLLERS

A. Description: Combined automatic and nonautomatic operation, complying with UL 508, UL Listed and FM approved, factory assembled and wired, factory tested for capacities and electrical characteristics, and with features indicated.

B. Enclosure: NEMA ICS 6, Type 2, drip-proof, indoor, except where special-purpose enclosure is indicated.

C. Include controls, devices, alarms, functions, and operations listed in NFPA 20 as required for driver and controller types used, and specific items listed for each controller type.

D. Nameplates: Provide nameplate complete with capacity, characteristics, approvals and listings, and other pertinent data on enclosure door.

E. Fire-Pump-Controller Enclosure Mounting: Wall- or floor-stand mounting, as indicated, for field electrical connections.

F. Fire-Pump-Controller Enclosure Mounting: Pump-base mounting and factory wired.

G. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.

H. Controller Sensing Pipes: Fabricate pipe and fittings according to NFPA 20 with nonferrous-metal sensing piping, 1/2-inch size, with globe valves for testing controller mechanism from system to pump controller as indicated. Include a bronze check valve with a 3/32-inch orifice in the clapper or a ground-face union with a noncorrosive diaphragm having a 3/32-inch orifice.

2.5 LIMITED-SERVICE CONTROLLERS

A. Description: Across-the-line type, listed for electric-drive fire pump service and service entrance.

B. Rate controllers for scheduled horsepower. Include short-circuit withstand rating at least equal to short-circuit current available at controller location. Take into account cable size and distance from substation or supply transformers.

2.6 ALARM PANELS

A. Enclosure: NEMA ICS 6, Type 1 remote wall-mounting-type panel with audible and visible alarms matching controller type.

B. Features: Include features as required by NFPA 20 and manufacturer's standard features.

C. Mounting: Wall mounting.

D. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.

2.7 ACCESSORIES

A. Match fire pump suction and discharge ratings as required for fire pump capacity rating. Include the following accessories:

1. Automatic air-release valve.

2. Casing relief valve.

3. Suction and discharge pressure gages.

4. Eccentric tapered reducer at suction inlet.

5. Concentric tapered reducer (increaser) at discharge outlet.

6. Test-Header Manifold: Ductile-iron or brass body for hose valves. Include nozzle outlets arranged in a single line; horizontal flush-wall mounting attachment; and rectangular, brass escutcheon plate with lettering equivalent to "PUMP TEST CONNECTION."

   a. Escutcheon Plate Finish: Rough brass.

7. Test-Header Manifold: Ferrous for hose valves. Manufacturer's standard finish. Include bronze or cast-iron, exposed-type valve header with nozzle outlets; and round brass escutcheon plate with lettering equivalent to "PUMP TEST CONNECTION."

8. Hose Valves: UL 668, straightway pattern, bronze. Include cap attached to valve with chain and NFPA 1963 hose thread that conforms to local fire department standards on valve outlet. Valve and cap finish is same as test-header-manifold escutcheon plate finish.

9. Ball Drip Valve: UL 1726.

10. Main Relief Valve: UL 1478, pilot operated.

11. Main Relief Valve: UL 1478, spring loaded.

B. Finish: Manufacturer's standard factory-applied red paint except where brass or another finish is specified.

2.8 PRESSURE-MAINTENANCE PUMPS

A. Multistage Pressure-Maintenance Pumps: Centrifugal, vertical construction, base mounted, factory assembled, and factory tested for capacities and characteristics indicated.

2.9 PRESSURE-MAINTENANCE PUMP CONTROLLERS

A. Description: Across-the-line type; complying with UL 508; UL listed; factory assembled, wired, and tested; combined automatic and nonautomatic operation. Include types, capacities, characteristics, and features indicated for electric-drive, pressure-maintenance pump service.

B. Enclosure: NEMA ICS 6, Type 2, wall mounted, for field electrical wiring.

C. Include controls, devices, alarms, functions, and operations listed in NFPA 20, and specific items listed.

D. Rate controller for scheduled horsepower and provide the following items:

1. Fusible disconnect switch.

2. Pressure switch.

3. "HAND-OFF-AUTO" selector switch.

4. Pilot light.

5. Running period timer.

E. Nameplates: Complete with capacity, characteristics, approvals and listings, and other pertinent data on enclosure door.

F. Mounting: Wall type for field electrical connections.

G. Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.

H. Controller Sensing Pipes: Fabricate pipe and fittings according to NFPA 20 with nonferrous-metal sensing piping, 1/2-inch size, with globe valves for testing controller mechanism from system to pump controller as indicated. Include a bronze check valve with a 3/32-inch orifice in the clapper or a ground-face union with a noncorrosive diaphragm having a 3/32-inch orifice.

2.10 PRESSURE-MAINTENANCE PUMP ACCESSORIES

A. Pressure-Maintenance Pump Accessories: Match pressure-maintenance pump suction and discharge ratings as required for pump capacity rating:

1. Casing relief valve.
2. Suction and discharge pressure gages.

2.11 SOURCE QUALITY CONTROL

A. Factory Tests: Hydrostatically test and test run fire pumps before shipping. Test at 150 percent of shutoff head plus suction head, but not less than 250 psig. Produce certified test curves showing head capacity and brake-horsepower of each pump.

2.12 GROUT

A. Non-shrink, Nonmetallic Grout: ASTM A 1107, Grade B.

B. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout.

C. Properties: Non-staining, noncorrosive, and nongaseous.

D. Recommended Uses: Interior and exterior applications.

E. Design Mix: 5000 psi, 28-day compressive strength.

F. Packaging: Factory premixed and packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment foundations, and conditions with Installer present for compliance with requirements for installation and other conditions affecting fire pump performance. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine fire-protection piping systems. Verify actual locations of piping connections prior to installation.

3.2 CONCRETE EQUIPMENT BASES

A. Install concrete equipment bases of dimensions indicated for fire pumps, pressure-maintenance pumps, and controllers.

3.3 INSTALLATION

A. Comply with fire pump and pressure-maintenance pump manufacturer's written installation and alignment instructions and with NFPA 20 and FM standards.

B. Install pumps in locations indicated and arrange to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.

C. Set base-mounted pumps on concrete equipment bases. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.

1. Support pump base plate on rectangular metal blocks and shims or on metal wedges having small taper, at points near foundation bolts to provide a gap of 3/4 to 1-1/2 inches between pump base and foundation for grouting.

2. Adjust metal supports or wedges until pump and driver shafts are level. Check coupling faces and pump suction and discharge flanges to verify that they are level and plumb.

D. Install suction and discharge pipe sizes equal to or greater than the diameter of fire pump nozzles.

E. Install valves of types and at locations indicated that are same size as the piping connecting fire pumps, bypasses, test headers, and other piping systems.

F. Install pressure gages on fire pump suction and discharge at integral pressure gage tappings provided.

G. Support pumps and piping separately so that weight of piping system does not rest on pumps.

H. Install piping accessories, hangers and supports, anchors, valves, meters and gages, and equipment supports as indicated for complete installation.

I. Install sensing elements where indicated. Install sensing element components and make connections according to manufacturer's written installation instructions.

J. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical Installer.

1. Verify that electrical wiring is installed according to manufacturer's submittal and installation requirements of Division 21 Sections. Do not proceed with equipment startup until wiring installation is acceptable.

3.4 ALIGNMENT

A. Align fire pump and driver shafts after complete unit has been leveled on foundation and after grout has set and foundation bolts have been tightened.

B. After alignment is correct, tighten foundation bolts evenly but not too firmly. Fill base plate completely with non-shrink, nonmetallic grout, with metal blocks and shims or wedges in place. After grout has hardened, fully tighten foundation bolts. Check alignment and take corrective measures required.

C. Make piping connections, check alignment, and take corrective measures required.

1. Adjust alignment of pump and driver shafts for angular and parallel alignment by 1 of 2 methods specified in Hydraulic Institute Standards Section "Centrifugal Pumps--Instructions for Installation, Operation and Maintenance."

2. Alignment Tolerances: Meet manufacturer's recommendations.

D. Align vertically mounted, axially split case pump and driver shafts after complete unit has been made plumb on foundation and after grout has set and foundation bolts have been tightened. Follow pump manufacturer's written instructions.

3.5 CONNECTIONS

A. Connect water supply to fire pumps and pressure-maintenance pumps.

B. Connect fire pump and pressure-maintenance pump discharge piping to building fire-protection water systems.

C. Connect fire pump controllers to building fire alarm system. Refer to Division 26 Section "Fire Alarm Systems."

D. Electrical wiring and connections are specified in Division 26 Sections.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of factory-authorized service representative to supervise field assembly of components, installation of fire pump units and pressure-maintenance pump units, including piping and electrical connections, field acceptance tests. Report test results in writing.

B. Check suction line connections for tightness to avoid drawing air into pumps.

C. Perform field-acceptance tests for each fire pump unit (fire pump, driver, and controller) and system piping when fire pump unit installation is complete. Comply with operating instructions and procedures of NFPA 20 to demonstrate compliance with requirements. Where possible, field-correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment that cannot be satisfactorily corrected or that does not perform as specified and as indicated, then retest to demonstrate compliance. Verify that each fire pump unit performs as specified and as indicated.

3.7 COMMISSIONING

A. Startup Services: Provide services of factory-authorized service representative to provide startup service and to demonstrate and train Owner's maintenance personnel as specified below.

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

3. Review data in the "Operating and Maintenance Manual."

4. Schedule training with at least 7 days' advance notice.

5. Provide fire hoses in number, size, and of length required to reach a storm drain or other acceptable location to dispose of fire pump test water. These fire hoses are for field acceptance tests only and are not intended to become property of the Owner.

B. Final Checks Before Startup: Perform the following preventive-maintenance operations and checks before startup:

1. Lubricate oil-lubricated bearings.

2. Remove grease-lubricated bearing covers and flush bearings with kerosene and thoroughly clean. Fill with new lubricant according to manufacturer's recommendations.

3. Disconnect coupling and check electric motor for proper rotation. Rotation shall match direction of rotation marked on pump casing.

4. Check that the pump is free to rotate by hand. Do not operate the pump if it is bound or if it drags even slightly until cause of trouble is determined and corrected.

C. Starting procedure for pumps:

1. Prime pump by opening suction valve and closing drains and prepare pump for operation.

2. Open sealing liquid supply valve if pump is so fitted.

3. Start motor.

4. Open discharge valve slowly.

5. Observe leakage from stuffing boxes and adjust sealing liquid valve for proper flow to ensure lubrication of packing. Do not tighten gland immediately, but let packing run in before reducing leakage through stuffing boxes.

6. Check general mechanical operation of pump and motor.

END OF SECTION 213113

SECTION 213113
ELECTRIC-DRIVE FIRE PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes electric-drive, horizontal fire pumps and accessories for fire-protection service. Include controller with automatic transfer switch for generator and full service reduced-voltage soft-start soft-stop electronic starter.

1.3 DEFINITIONS

A. Fire Pump: Pump used to supply water at rated capacity and total rated head required for fire-protection service.

B. Fire Pump Unit: Assembled unit consisting of fire pump, driver, controller, and accessories.

C. Fire Pump: Horizontal- or vertical-mounting, axially split case, electric-drive, horizontal fire pump.

D. Pressure-Maintenance Pump: Pump used to maintain water pressure in a sprinkler system.

E. Pressure-Maintenance Pump Unit: Assembled unit consisting of pressure-maintenance pump, driver, controller, and accessories.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide fire pump systems that include fire pump units, pressure-maintenance pump units, accessories, and piping that comply with performance requirements specified and are compatible with building fire-protection systems.

B. Pump, Equipment, Accessory, and Piping Pressure Rating: 175 psig minimum, except where a higher rating is indicated.

1.5 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and other Specification Sections.

B. Product data for fire pump units and pressure pump units. Include clearly stated rated capacities of each selected model, performance curve with each selection point indicated, driver, pump controller, furnished specialties, and accessories; plus weights (shipping and installed).

C. Product certificates signed by manufacturers of fire pumps, certifying that their products comply with specified requirements.

D. Test curves of fire pump manufacturer's factory tests for each fire pump, and certificates signed by manufacturer verifying that the test results comply with specified requirements.

E. Shop drawings showing layout and connections for fire pump units and pressure-maintenance pump units. Show pumps, drivers, controllers, accessories, and piping. Include setting drawings with templates and directions for installation of foundation bolts, anchor bolts, and other anchorages.

1. Shop drawings may be incorporated into other Division 21 fire-protection piping system shop drawings.

F. Wiring diagrams detailing field-installed wiring for power, signal, and control systems.

G. Field-acceptance test data showing proper performance according to provisions specified.

H. Maintenance data for each fire pump and pressure-maintenance pump unit to include in the "Operating and Maintenance Manual".

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firms whose fire pumps, pressure-maintenance pumps, drivers, controllers, and accessories are listed by product name and manufacturer in the UL "Fire Protection Equipment Directory" and FM "Approval Guide" and that comply with requirements indicated. The following listings are not required:

1. UL listing and FM approval of pressure-maintenance pumps.

2. FM approval of pressure-maintenance pump controllers.

B. Single-Source Responsibility: Obtain fire pump units and pressure-maintenance pump units, components, and accessories from a single source. Include a source with responsibility and accountability to answer and resolve problems regarding compatibility, installation, performance, and acceptance of units.

C. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.

D. Comply with local fire department/marshal standards pertaining to material, hose threads, and installation.

E. Comply with requirements of NFPA 20 "Standard for the Installation of Centrifugal Fire Pumps" for fire pumps, drivers, controllers, accessories, and installation.

F. Comply with requirements of NFPA 70 "National Electrical Code" for electrical materials and installation.

G. Comply with requirements of FM "Approval Guide" applicable to fire pumps, drivers, controllers, and accessories, and provide system capable of FM acceptance.

H. Manufacturer's Factory Tests: Perform factory test for each fire pump.

I. Design Criteria: The Drawings indicate sizes, profiles, connections, and dimensional requirements of fire pump and pressure-maintenance pump units and are based on specific manufacturer types and models indicated. Pump units having equal performance characteristics by other manufacturers may be considered, provided that deviations in dimensions and profiles do not change the design concept or intended performance as

judged by the Design Professional. The burden of proof for equality of units is on the proposer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Shipping: After assembling and testing fire pumps and pressure-maintenance pumps, clean flanges and exposed machined metal surfaces and treat with an anticorrosion compound. Protect flanges, pipe openings, and nozzles.

B. Store fire pumps, pressure-maintenance pumps, drivers, controllers, and accessories in a clean dry place.

C. Retain shipping flange protective covers and protective coatings during storage.

D. Protect bearings and couplings against damage from sand, grit, or other foreign matter.

E. Extended Storage Greater Than 5 Days: Dry internal parts with hot air or vacuum-producing device to prevent rusting. Upon drying, coat internal parts with protective liquid, such as light oil. Dismantle bearings and couplings, dry and coat with acid-free heavy oil, and then tag and store in a dry location.

F. Comply with manufacturer's rigging instructions for handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Fire Pumps:

a. Armstrong Darling, Inc.
b. Aurora Pump, General Signal Corp.
c. Fairbanks Morse Pump Div., Colt Industries.
d. ITT A-C Pump, ITT Fluid Technology Corp.
e. Paco Pumps, Inc.
f. Patterson Pump Co. Subsid., Gorman-Rupp Co.
g. Peerless Pump, Sterling Fluid Products, Inc.
h. Reddy-Buffaloes Pump, Inc.

2. Multistage Pressure-Maintenance Pumps:

a. Aurora Pump, General Signal Corp.
b. Grundfos Pumps Corp.
c. ITT A-C Pump, ITT Fluid Technology Corp.
d. Patterson Pump Co. Subsid., Gorman-Rupp Co.
e. Peerless Pump, Sterling Fluid Products, Inc.
f. Taco, Inc.

3. Pump Controllers and Alarm Panels:

a. Firetrol, Inc.
b. Hubbell Industrial Controls, Inc.
c. Joslyn Clark Controls, Inc. Subsid., Joslyn Corp.

d. Master Control Systems, Inc.
e. Metron, Inc.

2.2 FIRE PUMPS

A. Description: Single-stage, double-suction, UL 448, factory-assembled and -tested, electric-drive fire pump of capacities and characteristics indicated.

B. Characteristics: Capable of furnishing not less than 150 percent of rated capacity at not less than 65 percent of total rated head. Shutoff head is limited to 120 percent of total rated head.

C. Casing Construction: Axially split case, centrifugal design; cast-iron pump casing with suction and discharge flanges machined to ASME B16.1 dimensions, and 125-psig pressure rating, except where 250-psig rated flanges are indicated.

D. Impeller Construction: Statically and dynamically balanced, of construction to match fire pump type, fabricated from cast bronze, keyed to shaft.

E. Wear Rings: Replaceable, bronze.

F. Pump Shaft and Sleeve: Steel shaft with bronze sleeve.

G. Pump Shaft Bearings: Grease-lubricated ball bearings contained in cast-iron housing.

H. Seals: Stuffing box with minimum of 4 rings of graphite-impregnated braided yarn with bronze lantern ring between center 2 graphite rings, and bronze packing gland.

I. Pump Couplings: Flexible, capable of absorbing torsional vibration and shaft misalignment, with metal coupling guard.

J. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.

K. Nameplates: Complete with capacities, characteristics, and other pertinent data.

2.3 DRIVERS

A. Description: NEMA MG 1, open drip-proof, squirrel-cage, induction motors. Include construction that complies with NFPA 20 and NFPA 70 and wiring compatible with controller used.

B. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.

C. Nameplates: Complete with motor horsepower, characteristics, and other pertinent data.

2.4 CONTROLLERS

A. Description: Combined automatic and nonautomatic operation, complying with UL 508, UL Listed and FM approved, factory assembled and wired, factory tested for capacities and electrical characteristics, and with features indicated.

B. Enclosure: NEMA ICS 6, Type 2, drip-proof, indoor, except where special-purpose enclosure is indicated.

C. Include controls, devices, alarms, functions, and operations listed in NFPA 20 as required for driver and controller types used, and specific items listed for each controller type.

D. Nameplates: Provide nameplate complete with capacity, characteristics, approvals and listings, and other pertinent data on enclosure door.

E. Fire-Pump-Controller Enclosure Mounting: Wall- or floor-stand mounting, as indicated, for field electrical connections.

F. Pressure-Maintenace-Pump-Controller Enclosure Mounting: Wall-mounting, as indicated, for field electrical connections.

G. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.

2.5 FULL-SERVICE FIRE PUMP CONTROLLERS

A. Description: Reduced-voltage soft-start soft-stop electronic starter, listed for electric-drive fire pump service and service entrance.

B. Rate controllers for scheduled horsepower. Include short-circuit withstand rating at least equal to short-circuit current available at controller location. Take into account cable size and distance from substation or supply transformers.

C. Automatic Transfer Switches: Enclosures complying with UL 1008 and requirements for and attached to fire pump controllers. Include automatic transfer switches with rating at least equal to fire-pump-driver motor horsepower. When motor is rated in amperes, include ampere rating not less than 115 percent of motor full-load current and suitable for switching motor-locked rotor current.

D. Controllers: Capable of performing or containing the following features:

1. Isolating means and circuit breaker.
2. "Power On" pilot lamp.
3. Fire alarm system connections for indicating motor running condition, loss of line power, and line power phase reversal.
4. Automatic and manual operation, and minimum run-time relay to prevent short cycling.
5. Water-pressure-actuated switch having independent high and low calibrated adjustments responsive to water pressure in fire-protection system.
6. Manual and automatic shutdown.

2.6 ALARM PANELS

A. Enclosure: NEMA ICS 6, Type 1 remote wall-mounting-type panel with audible and visible alarms matching controller type.

B. Features: Include the following features and manufacturer's standard features:

1. Motor-operating condition.
2. Loss of line power.
3. Phase reversal.
4. Low-water alarm.

C. Mounting: Wall mounting.

D. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.

2.7 ACCESSORIES

A. Match fire pump suction and discharge ratings as required for fire pump capacity rating. Include the following accessories:

1. Automatic air-release valve.
2. Casing relief valve.
3. Suction and discharge pressure gages.
4. Eccentric tapered reducer at suction inlet.
5. Concentric tapered reducer (increaser) at discharge outlet.
6. Test-Header Manifold: Ductile-iron or brass body for hose valves. Include nozzle outlets arranged in a single line; horizontal flush-wall mounting attachment; and rectangular, brass escutcheon plate with lettering equivalent to "PUMP TEST CONNECTION."

    a. Escutcheon Plate Finish: Rough brass.

7. Hose Valves: UL 668, straightway pattern, bronze. Include cap attached to valve with chain and NFPA 1963 hose thread that conforms to local fire department standards on valve outlet. Valve and cap finish is same as test-header-manifold escutcheon plate finish.
8. Ball Drip Valve: UL 1726.
9. Main Relief Valve: UL 1478.

2.8 PRESSURE-MAINTENANCE PUMPS

A. Multistage Pressure-Maintenance Pumps: Centrifugal, vertical construction, base mounted, factory assembled, and factory tested for capacities and characteristics indicated.

1. Construction: Bronze or cast-iron pump casing with suction and discharge connections of size indicated, threaded, or flanged and machined to ASME B16.1 dimensions, and 125-psig minimum pressure rating, except where 250-psig rated flanges are indicated.

    a. Impeller: Bronze or stainless steel.
    b. Shaft: Stainless steel.
    c. Seals: Mechanical.

2. Nameplates: Provide nameplate complete with capacity, characteristics, and other pertinent data.
3. Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.

2.9 PRESSURE-MAINTENANCE PUMP CONTROLLERS

A. Description: Across-the-line type; complying with UL 508; UL listed; factory assembled, wired, and tested; combined automatic and nonautomatic operation. Include types, capacities, characteristics, and features indicated for electric-drive, pressure-maintenance pump service.

B. Enclosure: NEMA ICS 6, Type 2, wall mounted, for field electrical wiring.

C. Include controls, devices, alarms, functions, and operations listed in NFPA 20, and specific items listed.

D. Rate controller for scheduled horsepower and provide the following items:

1. Fusible disconnect switch.
2. Pressure switch.
3. "HAND-OFF-AUTO" selector switch.
4. Pilot light.
5. Running period timer.

E. Nameplates: Complete with capacity, characteristics, approvals and listings, and other pertinent data on enclosure door.

F. Mounting: Wall type for field electrical connections.

G. Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.

H. Controller Sensing Pipes: Fabricate pipe and fittings according to NFPA 20 with nonferrous-metal sensing piping, 1/2-inch size, with globe valves for testing controller mechanism from system to pump controller as indicated. Include a bronze check valve with a 3/32-inch orifice in the clapper or a ground-face union with a noncorrosive diaphragm having a 3/32-inch orifice.

2.10 PRESSURE-MAINTENANCE PUMP ACCESSORIES

A. Pressure-Maintenance Pump Accessories: Match pressure-maintenance pump suction and discharge ratings as required for pump capacity rating:

1. Casing relief valve.
2. Suction and discharge pressure gages.

2.11 GROUT

A. Non-shrink, Nonmetallic Grout: ASTM A 1107, Grade B.

B. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout.

C. Properties: Non-staining, noncorrosive, and nongaseous.

D. Recommended Uses: Interior and exterior applications.

E. Design Mix: 5000 psi, 28-day compressive strength.

F. Packaging: Factory premixed and packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment foundations, and conditions with Installer present for compliance with requirements for installation and other conditions affecting fire pump performance. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine fire-protection piping systems. Verify actual locations of piping connections prior to installation.

3.2 CONCRETE EQUIPMENT BASES

A. Install concrete equipment bases of dimensions indicated for fire pumps, pressure-maintenance pumps, and controllers.

3.3 INSTALLATION

A. Comply with fire pump and pressure-maintenance pump manufacturer's written installation and alignment instructions and with NFPA 20 and FM standards.

B. Install pumps in locations indicated and arrange to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.

C. Set base-mounted pumps on concrete equipment bases. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.

1. Support pump base plate on rectangular metal blocks and shims or on metal wedges having small taper, at points near foundation bolts to provide a gap of 3/4 to 1-1/2 inches between pump base and foundation for grouting.

2. Adjust metal supports or wedges until pump and driver shafts are level. Check coupling faces and pump suction and discharge flanges to verify that they are level and plumb.

D. Install suction and discharge pipe sizes equal to or greater than the diameter of fire pump nozzles.

E. Install valves of types and at locations indicated that are same size as the piping connecting fire pumps, bypasses, test headers, and other piping systems.

F. Install pressure gages on fire pump suction and discharge at integral pressure gage tappings provided.

G. Support pumps and piping separately so that weight of piping system does not rest on pumps.

H. Install piping accessories, hangers and supports, anchors, valves, meters and gages, and equipment supports as indicated for complete installation.

I. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical Installer.

1. Verify that electrical wiring is installed according to manufacturer's submittal and installation requirements of Division 21 Sections. Do not proceed with equipment startup until wiring installation is acceptable.

3.4 ALIGNMENT

A. Align fire pump and driver shafts after complete unit has been leveled on foundation and after grout has set and foundation bolts have been tightened.

B. After alignment is correct, tighten foundation bolts evenly but not too firmly. Fill base plate completely with non-shrink, nonmetallic grout, with metal blocks and shims or wedges in place. After grout has hardened, fully tighten foundation bolts. Check alignment and take corrective measures required.

C. Make piping connections, check alignment, and take corrective measures required.

1. Adjust alignment of pump and driver shafts for angular and parallel alignment by 1 of 2 methods specified in Hydraulic Institute Standards Section "Centrifugal Pumps--Instructions for Installation, Operation and Maintenance."

2. Alignment Tolerances: Meet manufacturer's recommendations.

D. Align vertically mounted, axially split case pump and driver shafts after complete unit has been made plumb on foundation and after grout has set and foundation bolts have been tightened. Follow pump manufacturer's written instructions.

3.5 CONNECTIONS

A. Connect water supply to fire pumps and pressure-maintenance pumps.

B. Connect fire pump and pressure-maintenance pump discharge piping to building fire-protection water systems.

C. Connect fire pump controllers to building fire alarm system. Refer to other Division 26 sections.

D. Install electrical connections for power, controls, and devices.

E. Electrical wiring and connections are specified in Division 26 Sections.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of factory-authorized service representative to supervise field assembly of components, installation of fire pump units and pressure-maintenance pump units, including piping and electrical connections, field acceptance tests. Report test results in writing.

B. Check suction line connections for tightness to avoid drawing air into pumps.

C. Perform field-acceptance tests for each fire pump unit (fire pump, driver, and controller) and system piping when fire pump unit installation is complete. Comply with operating instructions and procedures of NFPA 20 to demonstrate compliance with requirements. Where possible, field-correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment that cannot be satisfactorily corrected or that does not perform as specified and as indicated, then retest to demonstrate compliance. Verify that each fire pump unit performs as specified and as indicated.

3.7 COMMISSIONING

A. Startup Services: Provide services of factory-authorized service representative to provide startup service and to demonstrate and train Owner's maintenance personnel as specified below.

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

3. Review data in the "Operating and Maintenance Manual."

4. Schedule training with at least 7 days' advance notice.

5. Provide fire hoses in number, size and of length required to reach a storm drain or other acceptable location to dispose of fire pump test water. These fire hoses are for field acceptance tests only and are not intended to become property of the Owner.

B. Final Checks Before Startup: Perform the following preventive-maintenance operations and checks before startup:

1. Lubricate oil-lubricated bearings.

2. Remove grease-lubricated bearing covers and flush bearings with kerosene and thoroughly clean. Fill with new lubricant according to manufacturer's recommendations.

3. Disconnect coupling and check electric motor for proper rotation. Rotation shall match direction of rotation marked on pump casing.

4. Check that the pump is free to rotate by hand. Do not operate the pump if it is bound or if it drags even slightly until cause of trouble is determined and corrected.

C. Starting procedure for pumps:

1. Prime pump by opening suction valve and closing drains and prepare pump for operation.

2. Open sealing liquid supply valve if pump is so fitted.

3. Start motor.

4. Open discharge valve slowly.

5. Observe leakage from stuffing boxes and adjust sealing liquid valve for proper flow to ensure lubrication of packing. Do not tighten gland immediately but let packing run in before reducing leakage through stuffing boxes.

6. Check general mechanical operation of pump and motor.

END OF SECTION 213113

SECTION 220000
GENERAL PLUMBING PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes general provisions covering the contract documents for Plumbing Systems.

1.3 DEFINITIONS

A. Provide shall mean "Furnish, install and connect."

B. Piping shall mean "pipe installed with all specified fittings, valves and accessories, and forming a complete system."

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Electrical Coordination: In addition to submittal requirements of other Division 22 Sections, submit a document approved by the project Electrical Contractor certifying that all mechanical equipment being furnished under Division 22 complies with the electrical characteristics of the source power which will be furnished under Divisions 26 and 27.

C. Model numbers listed on the Mechanical Contract Documents shall not be construed to indicate electrical characteristics. Electrical characteristics of mechanical equipment shall be as indicated on the Electrical Contract Documents (Division 26).

D. Review of Submittals does not relieve the Contractor of any of the requirements of the Contract Documents. Failure by the Engineer to document errors and omissions in the Contractor's submittals during the Engineer's submittal review does not constitute a waiver of any of the requirements of the original sealed Contract Documents.

1.5 CONTRACTOR QUALIFICATIONS

A. Plumbing Subcontractor shall have a Class II Unlimited License and shall have demonstrated proficiency in the installation of plumbing systems by the successful installation of systems similar to those included in the Construction Documents for this project. Such systems shall have been installed in commercial or institutional buildings having a minimum of 150 plumbing fixtures (in a single building). The Subcontractor shall have been in business as described above for a minimum period of five years.

B. A master or journeyman plumber shall be present at the site during the installation of all plumbing related work. The master or journeyman plumber shall be certified in the state in which the construction is being performed and shall have his license present at site or on file during construction.

1.6 PRIOR APPROVALS

A. Manufacturers References: When reference is made in the Contract Documents to trade names or specific manufacturers and/or models, such reference, unless noted otherwise, is made to designate and identify the quality of materials or equipment to be furnished and is not intended to restrict competitive bidding. If it is desired to use materials or equipment different from those indicated on the Contract Documents, written request for approval must reach the hands of the Primary Design Professional at least TEN DAYS prior to the date set for the opening of bids. A copy of the request should also be sent directly to the Engineer. Requests for prior approval of a proposed substitute shall be accompanied by complete technical data supporting the request.

1.7 LAYOUT AND COORDINATION

A. Layout Basis:

1. The equipment listed on the Drawings and in the Specifications has been used for the physical arrangement of the mechanical systems. When equipment listed as acceptable, equal or equipment which has received "prior approval" is used, it shall be the Contractor's responsibility to provide structural, ductwork, electrical, service clearances, or other changes required to accommodate the substituted equipment. Changes shall be made at no additional cost to the Owner. Submit a list of required changes along with all prior approval requests and shop drawing submittals.

2. The Contract Drawings are intended to show the general arrangement of all mechanical work. They do not show in detail all offsets, fittings and transitions. Examine Drawings, investigate site conditions to be encountered and arrange work accordingly. Furnish all offsets and transitions required.

3. Drawings do not indicate in detail exact configuration of connections for fixtures, equipment and accessories. Final connection shall be as shown on approved Manufacturer's Submittal Drawings. Where Manufacturer's Submittal Drawings conflict with the Contract Documents, confer with the Design Professional for resolution.

4. Measurement of Drawings by scale shall not be used as dimensions for fabrication. Measurements for locating fixtures, equipment, ductwork, piping and other mechanical items shall be made on the site and shall be based on actual job conditions.

5. Check space limitations and verify electrical requirements before ordering any mechanical equipment or materials. Place large equipment inside the building prior to the erection of exterior walls where equipment cannot enter finished building openings.

B. Coordination: Mechanical work shall be coordinated with that of other trades to avoid conflict. The Contractor shall study all plans and specifications for this project and shall notify the Design Professional of any conflict between work under Division 22 and work under other divisions of the Project. Particular attention shall be given to interference between piping, electrical installations, structural systems, building openings and ductwork.

C. Installation Instructions: Manufacturer's installation instructions for all equipment furnished under Division 22 shall be furnished by the Contractor. Instructions shall be maintained on the jobsite until the project is complete, and then turned over to the Owner.

D. Operation and Maintenance Instructions: Electronic copies of equipment O&M manuals shall be submitted to the Owner a minimum of 15 days prior to equipment/systems training. An index document indicating project name, project number, building name and contents shall be included. Model and serial numbers of equipment shall be shown on the cover of their respective O&M manual(s). Warranty registration documentation shall be included where applicable, including documentation confirming warranties have been registered with the equipment manufacturer.

1.8 PERMITS

A. Obtain all necessary Permits and Inspections required for the installation of this work and pay all charges incident thereto. Deliver to the Design Professional all certificates of inspection issued by authorities having jurisdiction.

1.9 SAFETY

A. OSHA Requirements applicable to the project shall be complied with at all times.

B. Manufacturer's Safety Instructions shall be followed in all instances.

C. Asbestos Containing Materials (ACM) shall not be used on this project.

D. Refrigerants containing CFC's or HCFC's shall not be used on this project, nor shall any equipment using such refrigerants be incorporated into this project.

E. Electrical Equipment Clearances: Piping, equipment and other mechanical installations shall not be located within 42" of the front or 36" of the side of any electrical switchboards, panelboards, power panels, motor control centers, electrical transformers or similar electrical equipment. Piping and ductwork shall not pass through or above electrical equipment rooms except as required to serve those rooms.

F. Guards shall be provided where appliances, equipment, fans or other components that require service are located within 10 feet of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches above the floor, roof or grade below. The guard shall extend not less than 30 inches beyond each end of such appliances, equipment, fans, components and roof hatch openings and the top of the guard shall be located not less than 42 inches above the elevated surface adjacent to the guard. The guard shall be constructed so as to prevent the passage of a 21 inch diameter sphere and shall comply with the loading requirements for guards specified in the International Building Code.

1.10 PROTECTION OF PLUMBING SYSTEMS DURING CONSTRUCTION

A. Material storage

1. All materials and equipment stored on the jobsite shall be elevated above the ground and stored under suitable weather cover. Materials and equipment shall not be situated in areas subjected to localized flooding.

2. Manufacturer's original shipping packaging and protective coverings shall be left in place until the equipment is prepared for installation.

B. Roof protection: All penetrations through roofs, including roof vents and roof drainage system elements shall be properly protected during construction to prevent water intrusion into the building. Protective measures could include temporary covers and plugs, as well as other appropriate temporary elements.

C. Electrical enclosure protection

1. During construction, all protective covers and other devices shall be left in place that protect against inadvertent contact with live electrical circuits.

2. All warning labels related to electrical and rotating equipment hazards shall be in place prior to energizing mechanical equipment circuits.

D. Protection of equipment and piping

1. Maintain temporary closures on the ends of all equipment and pipes as the installation work progresses. Temporary closures include plastic sheeting, tape and appropriate caps and covers.

2. Where debris enters piping during installation, steps shall be taken to clean the interior of the pipe prior to placing in service.

3. Where debris enters equipment during installation the duct interior shall be cleaned prior to placing in service.

1.11 CODES AND STANDARDS

A. Mechanical installations shall conform to the current edition (recognized by the State) of the following, in addition to any previously mentioned Codes and Standards.

1. The International Building Code.

2. The International Mechanical Code.

3. The International Plumbing Code.

4. The International Fire Protection Code.

5. The State Energy Code.

6. NFPA Standard 70, National Electric Code.

7. NFPA Standard 101, Code for Safety to Life for Fire in Buildings and Structures.

1.12 ASBESTOS MATERIALS

A. Contractor is advised there may be ASBESTOS PRODUCTS in building(s) which will affect work under this Project. Particular reference is made to piping, equipment and other items that may be modified or removed. It shall be the sole responsibility of Contractor to check for and ascertain presence of asbestos materials where such presence affects work under this Project. Where Contractor ascertains presence of asbestos materials, he shall notify Owner and Engineer in writing of presence of asbestos BEFORE beginning any work. Removal of asbestos products shall be the responsibility of Owner AFTER he has been notified by Contractor of its presence.

B. Engineer assumes no responsibility of investigating for presence of ASBESTOS PRODUCTS or for verifying presence of asbestos materials, nor does Engineer assume any responsibility for specifying, advising on, or supervising removal of any asbestos products. Contractor and Owner shall hold harmless Engineer in any matters involving presence of, or removal of, asbestos products.

1.13 INTERRUPTION OF EXISTING SERVICES

A. Exercise care so as not to cut any existing utilities or services. Where an existing utility line or service line is cut it shall be repaired to "like-new" condition. Interruption of service shall not be made without prior written permission of the Owner.

B. Plumbing system must remain in service during construction. Arrange with the Owner well in advance of shutdowns required for tie-ins. Shutdowns shall be made after normal occupancy hours if so directed by the Owner. No additional monies will be paid for after-hours shutdowns.

PART 2 - PRODUCTS Not required for this section.

PART 3 - EXECUTION Not required for this section.

END OF SECTION 220000

SECTION 220500
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement other Division 22 sections.

1. Piping materials and installation instructions common to most piping systems.

2. Concrete equipment base construction requirements.

3. Equipment nameplate data requirements.

4. Field-fabricated metal equipment supports.

5. Installation requirements common to equipment specification Sections.

6. Mechanical demolition.

7. Cutting and patching.

8. Touchup painting and finishing.

B. Pipe and pipe fitting materials are specified in piping system Sections.

1.3 DEFINITIONS

A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.

B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data for following piping specialties:

1. Identification materials and devices.

C. Samples of color, lettering style, and other graphic representation required for each identification material and device.

D. Shop drawings detailing fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

E. Coordination drawings for access panel and door locations.

F. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

A. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code--Steel."

B. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.

C. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

D. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

E. Coordinate all electrical service requirements for mechanical equipment prior to the submittal of shop drawings. Confirm the compatibility of all power services with the equipment being furnished. Confirm compatibility of electrical lugs being provided by the equipment manufacturer with the power wiring being furnished under Division 26. Furnish written documentation that all characteristics have been coordinated with and confirmed by the electrical subcontractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Protect stored plastic pipes from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

E. Coordinate connection of electrical services.

F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces.

H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual piping system specification Sections in Division 22 for special joining materials not listed below.

B. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch minimum thickness, except where thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125 cast-iron and cast-bronze flanges.

b. Narrow-Face Type: For raised-face, Class 250 cast-iron and steel flanges.

2. ASME B16.20 for grooved, ring-joint, steel flanges.

3. AWWA C110, rubber, flat face, 1/8-inch thick, except where other thickness is indicated; and full-face or ring type, except where type is indicated.

C. Solder Filler Metal: ASTM B 32.

1. Alloy Sn95 or Alloy Sn94: Tin (approximately 95 percent) and silver (approximately 5 percent), having 0.10 percent lead content.

D. Brazing Filler Metals: AWS A5.8.

1. BCuP Series: Copper-phosphorus alloys.

2. BAg1: Silver alloy.

E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Solvent Cements: Manufacturer's standard solvents complying with the following:

1. Acrylonitrile-Butadiene-Styrene (ABS): ASTM D 2235.

2. Chlorinated Poly (Vinyl Chloride) (CPVC): ASTM F 493.

3. Poly (Vinyl Chloride) (PVC): ASTM D 2564.

4. PVC to ABS Transition: Made to requirements of ASTM D 3138, color other than orange.

G. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.

2.3 PIPING SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type where required to conceal protruding fittings and sleeves.

1. Inside Diameter: Closely fit around pipe, tube, and insulation.

2. Outside Diameter: Completely cover opening.

3. Cast Brass: One-piece, with set-screw.

a. Finish: Polished chrome plate.

4. Cast Brass: Split casting, with concealed hinge and set-screw.

a. Finish: Polished chrome plate.

5. Stamped Steel: One-piece, with set-screw and chrome-plated finish.

6. Stamped Steel: Split plate, with concealed hinge, set-screw, and chrome-plated finish.

7. Stamped Steel: Split plate, with exposed-rivet hinge, set-screw, and chrome-plated finish.

8. Cast-Iron Floor Plate: One-piece casting.

B. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.

1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.

2. Insulating Material: Suitable for system fluid, pressure, and temperature.

3. Dielectric Unions: Factory-fabricated, union assembly for 250-psig minimum working pressure at a 180 deg F temperature.

4. Dielectric Flanges: Factory-fabricated, companion-flange assembly for 150- or 300-psig minimum pressure to suit system pressures.

5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.

6. Dielectric Couplings: Galvanized-steel coupling, having inert and noncorrosive, thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F temperature.

7. Dielectric Nipples: Electroplated steel nipple, having inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig working pressure at 225 deg F temperature.

C. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet-Metal: 24-gage or heavier galvanized sheet metal, round tube closed with welded longitudinal joint.

2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.

3. Cast-Iron: Cast or fabricated wall pipe equivalent to ductile-iron pressure pipe, having plain ends and integral water stop, except where other features are specified.

4. Wall Penetration Systems: Wall sleeve assembly, consisting of housing, gaskets, and pipe sleeve, with 1 mechanical-joint end conforming to AWWA C110 and 1 plain pipe-sleeve end.

a. Penetrating Pipe Deflection: 5 percent without leakage.

b. Housing: Ductile-iron casting having water-stop and anchor ring, with ductile-iron gland, steel studs and nuts, and rubber gasket conforming to AWWA C111, of housing and gasket size as required to fit penetrating pipe.

c. Pipe Sleeve: AWWA C151, ductile-iron pipe.

d. Housing-to-Sleeve Gasket: Rubber or neoprene push-on type of manufacturer's design.

5. Cast-Iron Sleeve Fittings: Commercially made sleeve having an integral clamping flange, with clamping ring, bolts, and nuts for membrane flashing.

a. Underdeck Clamp: Clamping ring with set-screws.

D. Piping Roof Curbs:

1. Curb and cap shall be constructed of minimum 18-guage galvanized sheet metal with continuous welded seams.

2. Provide cant-strip at the base of curb for flashing.

3. Line curb with 1½-inch fiberglass insulation.

4. Galvanized sheet metal cap shall have welded sheet metal collars (sleeves) for each pipe that allow for installation of insulated pipe.

5. Seal annular space between pipe/insulation and collar with a flexible weatherproof boot and stainless-steel pipe clamps.

6. Cap shall be secured to the curb nailer with cadmium plated screws; minimum one per side.

2.4 FIRE-STOPPING

A. Fire-Resistant Sealant: Provide UL Listed firestopping system for filling openings around penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

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

1. Specified Technologies, Inc.
2. 3M Corporation
3. Metacaulk.
4. Hilti, Inc.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS--COMMON REQUIREMENTS

A. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 22 specify piping installation requirements unique to the piping system.

B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

C. Install piping at indicated slope.

D. Install components having pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's printed instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, suspended ceilings, cabinet interiors and other exposed locations, according to the following:

1. Chrome-Plated Piping: Cast-brass, one-piece, with set-screw, and polished chrome-plated finish. Use split-casting escutcheons, where required, for existing piping.

2. Uninsulated Piping Wall Escutcheons: Cast-brass or stamped-steel, with set-screw.

3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.

4. Insulated Piping: Cast-brass or stamped-steel, with concealed hinge and chrome-plated finish.

5. Piping in Utility Areas: Cast-brass or stamped-steel, with set-screw clips.

N. Install sleeves for pipes passing through concrete and masonry walls, concrete floor and roof slabs, exterior walls and where indicated.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring where specified.

2. Build sleeves into new walls and slabs as work progresses.

3. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than 6 inches.

b. Steel Sheet-Metal Sleeves: For pipes 6 inches and larger that penetrate gypsum-board partitions.

c. Cast-Iron Sleeve Fittings: For floors having membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

1) Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.

4. Except for below-grade wall penetrations, seal annular space between sleeve and pipe or pipe insulation in non-rated floors and partitions, using elastomeric joint sealants. EXCEPTION: Fire rated partition penetrations shall be sealed with U.L. Listed firestopping systems.

O. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with U.L. Listed firestopping sealant system.

P. Verify final equipment locations for roughing in.

Q. Refer to equipment specifications in other Sections for roughing-in requirements.

R. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system Sections.

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

3. Soldered Joints: Construct joints according to AWS "Soldering Manual," Chapter 22 "The Soldering of Pipe and Tube."

4. Brazed Joints: Construct joints according to AWS "Brazing Manual" in the "Pipe and Tube" chapter.

5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter. Join pipe fittings and valves as follows:

a. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.

b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).

c. Align threads at point of assembly.

d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.

e. Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

6. Welded Joints: Construct joints according to AWS D10.12 "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe" using qualified processes and welding operators according to the "Quality Assurance" Article.

7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

8. Plastic Pipe and Fitting Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following standards:

a. Comply with ASTM F 402 for safe handling of solvent-cement and primers.

b. Poly (Vinyl Chloride) (PVC) Pressure Application: ASTM D 2672.

c. Poly (Vinyl Chloride) (PVC) Non-Pressure Application: ASTM D 2855.

d. PVC to ABS (Non-Pressure) Transition: Procedure and solvent cement described in ASTM D 3138.

S. Piping Connections: Except as otherwise indicated, make piping connections as specified below.

1. Install unions in piping 2 inches and smaller adjacent to each valve and at final connection to each piece of equipment having a 2-inch or smaller threaded pipe connection.

2. Install flanges in piping 2-1/2 inches and larger adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.

3. Install dielectric unions and flanges to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION--COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Design Professional.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.

D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

E. Install equipment giving right-of-way to piping systems installed at a required slope.

3.3 PAINTING AND FINISHING

A. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

B. Paint all exposed steel surfaces of piping and supports with one coat of primer and two coats of enamel.

3.4 CONCRETE BASES

A. Construct concrete equipment bases of dimensions indicated, but not less than 4 inches larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive strength concrete with 6 x 6 x #10 reinforcing wire mesh. Outdoor concrete bases shall extend a minimum of 4" above grade and be a minimum thickness of 6".

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1 "Structural Welding Code--Steel."

3.6 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of the trades involved.

B. Repair cut surfaces to match adjacent surfaces.

END OF SECTION 220500

SECTION 220519
METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes meters and gages used in mechanical systems.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data for each type of meter, gage, and fitting specified. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit a meter and gage schedule showing manufacturer's figure number, scale range, location, and accessories for each meter and gage.

C. Product certificates signed by manufacturers of meters and gages certifying accuracies under specified operating conditions and compliance with specified requirements.

1.4 QUALITY ASSURANCE

A. Comply with applicable portions of American Society of Mechanical Engineers (ASME) and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gages.

B. Design Criteria: The Drawings indicate types, sizes, capacities, ranges, profiles, connections, and dimensional requirements of meters and gages and are based on the specific manufacturer types and models indicated. Meters and gages having equal performance characteristics by other manufacturers may be considered, provided that deviations do not change the design concept or intended performance as judged by the Design Professional. The burden of proof for equality of meters and gages is on the proposer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Liquid-in-Glass Thermometers:

a. Marsh Instrument Co.
b. Marshalltown Instruments, Inc.
c. H.O. Trerice Co.
d. Weiss Instruments, Inc.
e. Weksler Instruments Corp.

2. Pressure Gages:

a. AMETEK, U.S. Gauge Div.
b. Ashcroft by Dresser Industries, Instrument Div.
c. Marsh Instrument Co.
d. Marshalltown Instruments, Inc.
e. H.O. Trerice Co.
f. Weiss Instruments, Inc.
g. Weksler Instruments Corp.
h. WIKA Instruments Corp.

2.2 THERMOMETERS, GENERAL

A. Scale Range: Temperature ranges for services listed as follows:

1. Domestic Hot Water: 30 to 240 deg F, with 2-degree scale divisions.

2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions.

B. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

2.3 LIQUID-IN-GLASS THERMOMETERS

A. Description: ASTM E 1, liquid-in-glass thermometer.

B. Case: Die-cast aluminum finished in baked-epoxy enamel, glass front, spring secured, 9 inches long.

C. Adjustable Joint: Finished to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

D. Tube: Red-reading, organic liquid-filled with magnifying lens.

E. Scale: Satin-faced nonreflective aluminum with permanently etched markings.

F. Stem: Copper-plated, steel, aluminum, or brass for a separable socket of length to suit installation.

2.4 THERMOMETER WELLS

A. Description: Brass or stainless-steel thermometer well.

B. Pressure Rating: Not less than piping system design pressure.

C. Stem Length: To extend to center of pipe.

D. Extension for Insulated Piping: 2 inches nominal, but not less than thickness of insulation.

E. Threaded Cap Nut: With chain permanently fastened to well and cap.

2.5 PRESSURE GAGES

A. Description: ASME B40.1, Grade A phosphor-bronze Bourdon-tube pressure gage, with bottom connection.

B. Case: Drawn steel, brass, or aluminum with 4-1/2-inch -diameter glass lens.

C. Connector: Brass, 1/4-inch.

D. Scale: White-coated aluminum, with permanently etched markings.

E. Accuracy: Plus or minus 1 percent of range span.

F. Range: Conform to the following:

1. Fluids Under Pressure: 2 times operating pressure.

2.6 PRESSURE-GAGE ACCESSORIES

A. Snubbers: 1/4-inch brass bushing with corrosion-resistant porous-metal disc of material suitable for system fluid and working pressure.

PART 3 - EXECUTION

3.1 METER AND GAGE APPLICATIONS

A. General: Where indicated, install meters and gages of types, sizes, capacities, and with features indicated.

3.2 METER AND GAGE INSTALLATION, GENERAL

A. Install meters, gages, and accessories according to manufacturers' written instructions for applications where used.

3.3 THERMOMETER INSTALLATION

A. Install thermometers and adjust vertical and tilted positions. Install in the locations indicated on the drawings.

B. Install in the following locations and elsewhere as indicated:

1. At inlet and outlet of each thermal storage tank, water heater or mixing valve.

C. Remote-Reading Dial Thermometers: Install in control panels with tubing connecting panel and thermometer bulb supported to prevent kinks. Use minimum tubing length.

D. Thermometer Wells: Install in vertical position in piping tees where thermometers are indicated.

1. Install wells with stem extending to center of pipe.

2. Fill wells with oil or graphite and secure caps.

3.4 PRESSURE GAGE INSTALLATION

A. Install pressure gages in piping tee with pressure gage valve located on pipe at most readable position. Install in locations indicated on the drawings.

B. Install in the following locations and elsewhere as indicated:

1. At suction and discharge of each pump.

2. At discharge of each pressure-reducing valve.

3. At building water service entrance.

C. Pressure Gage Needle Valves: Install in piping tee with snubber. Install syphon instead of snubber for steam pressure gages.

3.5 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. The Drawings indicate the general arrangement of piping, fittings, and specialties.

B. Install meters and gages adjacent to machines and equipment to allow servicing and maintenance.

3.6 ADJUSTING AND CLEANING

A. Calibrate meters according to manufacturer's written instructions, after installation.

B. Adjusting: Adjust faces of meters and gages to proper angle for best visibility.

C. Cleaning: Clean windows of meters and gages and factory-finished surfaces. Replace cracked and broken windows and repair scratched and marred surfaces with manufacturer's touchup paint.

END OF SECTION 220519

SECTION 220523
GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes general duty valves common to several mechanical piping systems.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data for each valve type. Include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application.

C. Maintenance data for valves to include in the operation and maintenance manual. Include detailed manufacturer's instructions on adjusting, servicing, disassembling, and repairing.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.

1. ASME B1.20.1 for threads for threaded end valves.

2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

3. Valve solder-joint connections are common in smaller sizes of plumbing piping. Soldering and brazing methods used to achieve required pressure-temperature ratings may damage internal valve parts. Special installation requirements for soldered valves may make threaded valves more cost-effective.

4. Caution: Use solder with melting point below 421 deg F (216 deg C).

5. ASME B16.18 for solder-joint connections.

6. ASME B16.51 for press-fit connections.

7. ASME B31.9 for building services piping valves.

B. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

C. Bronze and brass valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted unless the alloy is heat treated.

D. MSS Compliance: Comply with the various MSS Standard Practice documents referenced.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, grooves, and weld ends.

3. Set ball valves open to minimize exposure of functional surfaces.

4. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store indoors and maintain valve temperature higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 BASIC, COMMON FEATURES

A. Pressure and Temperature Ratings: As indicated in the "Application Schedule" of Part 3 of this Section and as required to suit system pressures and temperatures.

B. Sizes: Same size as upstream pipe, unless otherwise indicated. All valves shall be a full port design.

C. Valve Actuator Types:

1. Hand lever: For quarter-turn valves smaller than NPS 4 (DN 100).

D. Valves in Insulated Piping:

1. Include 2-inch (50-mm) stem extensions.

2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.

E. Threads: ASME B1.20.1.

F. Flanges: ASME B16.1 for cast iron, ASME B16.5 for steel, and ASME B16.24 for bronze valves.

G. Solder Joint: ASME B16.18.

1. Caution: Where soldered end connections are used, use solder having a melting point below 840 deg F for check valves; below 421 deg F for ball valves.

2.2 BALL VALVES

A. Brass Ball Valves, Two-Piece with Full Port and Stainless-Steel Trim, Threaded or Soldered Ends:

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

a. American Valve, Inc.
b. Apollo Flow Controls; Conbraco Industries, Inc.
c. Hammond Valve.
d. Jomar Valve.
e. Legend Valve & Fitting, Inc.
f. Nibco Inc.

2. Description:

a. Standard: MSS SP-110 or MSS SP-145.
b. CWP Rating: 600 psig (4140 kPa).
c. Body Design: Two piece.
d. Body Material: Heat treated forged brass.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Stainless steel.
h. Ball: Stainless steel.
i. Port: Full.

B. Brass Ball Valves, Two-Piece with Full Port and Stainless Steel Trim, Press-Fit Ends:

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

a. American Valve, Inc.
b. Apollo Flow Controls; Conbraco Industries, Inc.
c. Hammond Valve.
d. Jomar Valve.
e. Legend Valve & Fitting, Inc.
f. Nibco Inc.

2. Description:

a. Standard: MSS SP-110 or MSS SP-145.
b. CWP Rating: Minimum 250 psig (1724 kPa).
c. Body Design: Two piece.
d. Body Material: Heat treated forged brass.
e. Ends: Press-fit.
f. Press Ends Connections Rating: Minimum 250 psig (1724 kPa).
g. Seats: PTFE or RPTFE.
h. Stem: Stainless Steel.
i. Ball: Stainless Steel.
j. Port: Full.
k. O-Ring Seal: Buna-N or EPDM.

C. Bronze Ball Valves, Two-Piece with Full Port and Stainless Steel Trim, Press Ends:

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

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Hammond Valve.
c. Jomar Valve.
d. Milwaukee Valve Company.
e. Nibco Inc.

2. Description:

a. Standard: MSS SP-110 or MSS SP-145.

b. CWP Rating: Minimum 600 psig (1724 kPa).

c. Body Design: Two piece.

d. Body Material: Bronze.

e. Ends: Press.

f. Press Ends Connections Rating: Minimum 250 psig (1724 kPa).

g. Seats: PTFE or RPTFE.

h. Stem: Stainless Steel.

i. Ball: Stainless Steel.

j. Port: Full.

k. O-Ring Seal: Buna-N or EPDM.

2.3 CHECK VALVES

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

1. Description

a. American Valve, Inc.
b. Apollo Flow Controls; Conbraco Industries, Inc.
c. Hammond Valve.
d. Jomar Valve.
e. Milwaukee Valve Company.
f. Nibco Inc.

B. Swing Check Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi CWP, or Class 150, 300-psi CWP; horizontal swing, Y-pattern, ASTM B 62 cast-bronze body and cap, rotating bronze disc with rubber seat or composition seat, threaded or soldered end connections:

C. Swing Check Valves, 3 Inches and Larger: MSS SP-71, Class 125, 200-psi CWP, ASTM A 126 cast-iron body and bolted cap, horizontal-swing bronze disc, flanged or grooved end connections.

D. Lift Check Valves: Class 125, ASTM B 62 bronze body and cap (main components), horizontal or vertical pattern, lift-type, bronze disc or Buna N rubber disc with stainless-steel holder threaded or soldered end connections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION

A. Install valves as indicated, according to manufacturer's written instructions.

B. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.

C. Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.

D. Locate valves for easy access and provide separate support where necessary.

E. Install valves in horizontal piping with stem at or above the center of the pipe.

F. Install valves in a position to allow full stem movement.

G. Installation of Check Valves: Install for proper direction of flow as follows:

1. Swing Check Valves: Horizontal position with hinge pin level.

2. Lift Check Valve: With stem upright and plumb.

H. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

I. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

J. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B828 or CDA's "Copper Tube Handbook."

K. Press-Connect Joints for Copper Tubing: Join copper tube and pressure-connect fittings with tools recommended by fitting manufacturer.

1. Mark proper insertion depth prior to making press connection.

L. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

M. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE END SELECTION

A. Select valves with the following ends or types of pipe/tube connections:

1. Copper Tube Size, 4 Inches and Smaller: Solder ends or threaded ends.

B. Press-fit valve ends may be substituted in press-fit piping applications.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 4 Inches and Smaller:

1. Brass ball valves, two-piece with full port and stainless-steel trim. Provide with threaded, solder or press-fit joint ends.

2. Bronze ball valves, two-piece with full port and stainless-steel trim. Provide with threaded, solder or press-fit joint ends.

3.5 ADJUSTING

A. Adjust or replace packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if leak persists.

END OF SECTION 220523

SECTION 220529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes hangers and supports for mechanical systems piping and equipment.

1.3 DEFINITIONS

A. Terminology used in this Section is defined in MSS SP-90.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data for each type of hanger and support.

C. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

E. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.

1.5 QUALITY ASSURANCE

A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code--Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

C. NFPA Compliance: Comply with NFPA 13 for hangers and supports used as components of fire protection systems.

D. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.

1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.

E. Licensed Operators: Use operators that are licensed by powder-operated tool manufacturers to operate their tools and fasteners.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.

1. Components include galvanized coatings or alternate rust preventing shop coating.

2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

B. Thermal-Hanger Shield Inserts: 100-psi average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.

C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

2.2 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36, steel plates, shapes, and bars, black and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.

C. Washers: ASTM F 844, steel, plain, flat washers.

D. Grout: ASTM C 1107, Grade B, non-shrink, nonmetallic.

1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is non-staining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.

3. Water: Potable.

4. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in the Section specifying the equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 HANGER AND SUPPORT INSTALLATION

A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.

C. Install supports with maximum spacings complying with MSS SP-69.

D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.

F. Install concrete inserts in new construction prior to placing concrete.

G. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

H. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

K. Support all piping direct from structure and independent of other piping.

L. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

M. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.

O. Insulated Piping: Comply with the following installation requirements.

1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.

2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.

3. Shields: Install MSS Type 40, protective shields on insulated piping. Shields span an arc of 180 degrees and have dimensions in inches not less than the following:

NPS (Inches)	LENGTH (Inches)	THICKNESS (Inches)
1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
8 to 14	24	0.075
16 to 24	24	0.105

4. Pipes 6 Inches and Larger: Include shield inserts.

5. Insert Material: Length at least as long as the protective shield.

6. Thermal-Hanger Shields: Install with insulation of same thickness as piping.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.

B. Grouting: Place grout under supports for equipment and make a smooth bearing surface.

3.4 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.

B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedure for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without under-cut or overlap.

3. Remove welding flux immediately.

4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

C. Paint all exposed steel surfaces with one coat of primer and two coats of enamel.

END OF SECTION 220529

SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe labels.

2. Valve tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

PART 2 PRODUCTS

2.1 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to [partially cover] [cover full] circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction

2. Retain second option in "Lettering Size" Subparagraph below if visibility due to distance from piping is an issue.

3. Lettering Size: Size letters according to ASME A13.1 for piping.

2.2 VALVE TAGS

A. Valve Tags: Engraved with ¼-inch letters.

1. Material: 3/32-inch-thick plastic laminate with black surfaces and a white inner layer.

2. Material: Manufacturer's standard solid plastic.

3. Size: 4 by ¾ inch (102 by 19 mm).

4. Shape: Rectangular. Fasteners: Stainless-steel rivet, self-tapping screws or adhesive.

5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

PART 3 – EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Relocate mechanical identification materials and devices that have become visually blocked by work of this or other Divisions.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

C. Install on ceiling t-bars below above ceiling equipment.

3.4 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. Pipe Label Color Schedule:

1. Domestic Water Piping

a. Background: Safety green.

b. Letter Colors: White.

2. Natural Gas Piping:

a. Background: Safety green.
b.
c. Letter Colors: White.

3.5 VALVE-TAG INSTALLATION

A. Install on ceiling t-bars below above-ceiling valves.

END OF SECTION 220553

SECTION 220593
TESTING, ADJUSTING, AND BALANCING OF PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes testing, adjusting, and balancing plumbing systems to produce design objectives, including the following:

1. Balancing water flow within the domestic hot water return or hot water recirculation distribution systems to indicated quantities according to specified tolerances.

2. Reporting results of the activities and procedures specified in this Section.

B. Related Sections include the following:

1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.

2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate at the terminal equipment.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

D. Report Forms: Test data sheets for recording test data in logical order.

E. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

F. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

G. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

H. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

I. Test: A procedure to determine quantitative performance of a system or equipment.

J. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

K. AABC: Associated Air Balance Council.

L. NEBB: National Environmental Balancing Bureau.

1.4 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.

B. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3 of this Section.

C. Strategies and Procedures Plan: Within 60 days from the Contractor's Notice to Proceed, submit 2 copies of the testing, adjusting, and balancing strategies and step-by-step procedures as specified in Part 3 "Preparation" Article below. Include a complete set of report forms intended for use on this Project.

D. Certified Testing, Adjusting, and Balancing Reports: Submit reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

E. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

1.5 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.

B. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Design Professional's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, PLUMBING controls Installer, and other support personnel. Provide 7 days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

a. Submittal distribution requirements.

b. Contract Documents examination report.

c. Testing, adjusting, and balancing plan.

d. Work schedule and Project site access requirements.

e. Coordination and cooperation of trades and subcontractors.

f. Coordination of documentation and communication flow.

C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.

2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

3. Certify that the Agent has either tested and balanced systems according to the Contract Documents or that systems are balanced to optimum performance capabilities within design and installation limits.

D. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

E. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards or in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

F. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

G. Test and balance process is not deemed as accepted until a complete report is received free of deficiencies and discrepancies and approved in writing by the Engineer.

1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.7 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, controls installers, and other mechanics to operate plumbing systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on water distribution systems have been satisfactorily completed.

1.8 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Furnish one of the following special warranties:

1. National Project Performance Guarantee: Provide a guarantee on AABC'S "National Standards" forms stating that AABC will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents.

2. Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents.

PART 2 – PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.

2. Verify that balancing devices are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of plumbing systems and equipment.

C. Examine project record documents.

D. Examine equipment performance data, including pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of plumbing equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. Compare this data with the design data and installed conditions.

E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

F. Examine system and equipment test reports.

G. Examine plumbing system and equipment installations to verify that indicated balancing devices are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

H. Review manufacturer’s certification for each piece of plumbing equipment to be tested. Test and balance shall not be performed until certification letters have been obtained.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine equipment for installation and for properly operating safety interlocks and controls.

K. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" or AABC National Standards and this Section.

B. Mark equipment settings with paint or other suitable, permanent identification material, including valve indicators and similar controls and devices, to show final settings.

3.4 FUNDAMENTAL PROCEDURES FOR HOT WATER RETURN SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.

2. Check expansion tank liquid level.

3. Check flow-control valves for specified sequence of operation and set at design flow.

4. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type.

5. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.

3.5 HYDRONIC SYSTEMS' BALANCING PROCEDURES

A. Determine water flow at pumps. Use the following procedures, except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Verify with the pump manufacturer that this will not damage pump. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on the manufacturer's pump curve at zero flow and confirm that the pump has the intended impeller size.

2. Check system resistance. With all valves open, read pressure differential across the pump and mark the pump manufacturer's head-capacity curve. Adjust pump discharge valve until design water flow is achieved.

3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on the pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.

4. Report flow rates that are not within plus or minus 5 percent of design.

B. Set calibrated balancing valves at calculated pre-settings.

C. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

D. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than design flow.

E. Adjust balancing stations to within specified tolerances of design flow rate as follows:

1. Determine the balancing station with the highest percentage over design flow.

2. Adjust each station in turn, beginning with the station with the highest percentage over design flow and proceeding to the station with the lowest percentage over design flow.

3. Record settings and mark balancing devices.

F. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures.

G. Measure the differential-pressure control valve settings existing at the conclusions of balancing.

3.6 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.

3.7 TOLERANCES

A. Set plumbing system water flow rates within the following tolerances:

1. Hot Water Return Flow Rate: Minus 10 percent to plus 10 percent.

3.8 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to plumbing systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.9 FINAL REPORT

A. General: Electronic (PDF) format, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of document signed and sealed by the certified testing and balancing engineer.

1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:

1. Pump curves.

2. Manufacturers' test data.

3. Field test reports prepared by system and equipment installers.

4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

3.10 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION 220593

SECTION 220700
PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

A. This Section includes pipe and equipment insulation.

1.3 DEFINITIONS

A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.

B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.

C. Cold Surfaces: Normal operating temperatures less than 75 deg F.

D. Thermal resistivity is designated by an r-value that represents the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivity (r-value) is expressed by the temperature difference in degrees Fahrenheit between the two exposed faces required to cause 1 BTU per hour to flow through 1 square foot at mean temperatures indicated.

E. Thermal Conductivity (k-value): Measure of heat flow through a material at a given temperature difference; conductivity is expressed in units of Btu x inch/h x sq. ft. x deg F.

F. Density: Is expressed in lb./cu.ft.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract.

B. Product data for each type of mechanical insulation identifying k-value, thickness, and accessories. Provide a summary in schedule form of intended insulation material, jacket type, thickness and adhesive type for each pipe, duct or equipment using manufacturer's nomenclature.

1.5 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

1.6 SEQUENCING AND SCHEDULING

A. Schedule insulation application after testing of piping systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Glass Fiber:

a. CertainTeed Corporation.
b. Knauf Fiberglass GmbH.
c. Manville.
d. Owens-Corning Fiberglas Corporation.
e. USG Interiors, Inc. - Thermafiber Division.

2.2 GLASS FIBER

A. Material: Inorganic glass fibers, bonded with a thermosetting resin.

B. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.

C. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.

1. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.

2. Density: 3 pcf minimum.

D. Adhesive: Produced under the UL Classification and Follow-up service.

1. Type: Non-flammable, solvent-based.

2. Service Temperature Range: Minus 20 to 180 deg F.

E. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.3 INSULATING CEMENTS

A. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C 449.

1. Thermal Conductivity: 1.2 Btu x inch/h x sq. ft. x deg F average maximum at 400 deg F mean temperature.

2. Compressive Strength: 100 psi at 5 percent deformation.

2.4 ADHESIVES

A. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:

1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.

2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.5 JACKETS

A. General: ASTM C 921, Type 1, except as otherwise indicated.

B. Foil and Paper Jacket: Laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

1. Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E 96.

2. Puncture Resistance: 50 beach units minimum, when tested according to ASTM D 781.

C. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20 mil thick, high-impact, ultra-violet-resistant PVC.

1. Adhesive: As recommended by insulation manufacturer.

2.6 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition.

1. Water Vapor Permeance: 0.08 perm maximum.

2. Temperature Range: Minus 20 to 180 deg F.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

B. Mix insulating cements with clean potable water. Mix insulating cements contacting stainless-steel surfaces with demineralized water.

1. Follow cement manufacturer's printed instructions for mixing and portions.

3.2 INSTALLATION, GENERAL

A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.

B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

C. Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60 deg F.

D. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

E. Install insulation with smooth, straight, and even surfaces.

F. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.

G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.

H. Seal Ends: Taper ends at 45-degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.

I. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.

J. Keep insulation materials dry during application and finishing.

K. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:

1. Vibration control devices.

2. Testing laboratory labels and stamps.

3. Nameplates and data plates.

4. Sanitary drainage and vent piping. (Drainage piping receiving air conditioning condensate shall be insulated.)

5. Drainage piping located in crawl spaces, unless indicated otherwise.

6. Below grade piping except for hot water piping.

7. Chrome-plated pipes and fittings, except for plumbing fixtures for the disabled.

3.3 PIPE INSULATION INSTALLATION, GENERAL

A. Tightly butt longitudinal seams and end joints. Bond with adhesive.

B. Stagger joints on double layers of insulation.

C. Apply insulation continuously over fittings, valves, and specialties, except as otherwise indicated.

D. Apply insulation with a minimum number of joints.

E. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.

2. Cover circumferential joints with butt strips, at least 3 inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.

3. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.

a. Exception: Do not staple longitudinal laps on insulation applied to piping systems with surface temperatures at or below 35 deg F.

4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.

5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.

6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

F. Wall and Partition Penetration: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

G. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with a U.L. Listed firestopping or fire-resistant joint sealer.

H. Floor Penetrations: Terminate insulation underside of floor assembly and at floor support at top of floor.

I. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply pre-molded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.

1. Use the same material and thickness as adjacent pipe insulation.

2. Overlap nesting insulation by 2 inches or 1-pipe diameter, whichever is greater.

3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.

4. Insulate elbows and tees smaller than 3 inches pipe size with pre-molded insulation.

5. Insulate elbows and tees 3 inches and larger with pre-molded insulation or insulation material segments. Use at least 3 segments for each elbow.

6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.

J. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments."

3.4 GLASS FIBER PIPE INSULATION INSTALLATION

A. Bond insulation to pipe with lagging adhesive.

B. Seal exposed ends with lagging adhesive.

C. Seal seams and joints with vapor barrier compound.

3.5 JACKETS

A. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2 inches laps at longitudinal joints and 3-inch-wide butt strips at end joints.

1. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound (mastic) and glass tape (glassfab).

3.6 FINISHES

A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed exterior insulation.

3.7 APPLICATIONS

A. General: Materials and thicknesses are specified in schedules at the end of this Section.

B. Piping Systems: Unless otherwise indicated, insulate the following piping systems:

1. Domestic cold water.

2. Domestic hot water.

3. Recirculated hot water.

3.8 PIPE INSULATION SCHEDULES

A. Schedules:

1. Domestic Cold-Water Piping (including makeup water piping): 1" rigid fiberglass insulation.

2. Domestic Hot Water and Recirculation Piping:

a. 1" rigid fiberglass insulation for piping 1-1/4" and smaller.

b. 1-1/2" rigid fiberglass insulation for piping larger than 1-1/2".

END OF SECTION 220700

SECTION 221116
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Piping and fittings.
2. Piping joining materials.
3. Transition fittings.
4. Dielectric fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

1.5 WARRANTY

A. Special Limited Warranty: For press-connect fitting and valves, include manufacturer’s standard warranty for the following:

1. Warranty Period for Press-Connect Fittings: 50 years from date of Substantial Completion.
2. Warranty Period for Press-Connect Valves: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B88, Type L (ASTM B88M, Type B) water tube, drawn temper.

B. Soft Copper Tube: ASTM B88, Type K (ASTM B88M, Type A) water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Copper Unions:

1. MSS SP-123.

2. Cast-copper-alloy, hexagonal-stock body.

3. Ball-and-socket, metal-to-metal seating surfaces.

4. Solder-joint or threaded ends.

F. Copper Press-Connect Fittings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Flow Controls; Conbraco Industries, Inc., ApolloXpress.
b. NIBCO INC.
c. Viega LLC, Propress.

2. Fittings for NPS 2 (DN 50) and Smaller: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

3. Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

4. NPS 2-1/2 thru NPS 4 (DN 65 to DN 100) Fittings: Stainless steel grip ring and EPDM O-ring seal in each end.

5. Press Ends: Un-pressed fitting identification feature to the fitting wall.

6. Sealing Element: EPDM.

2.3 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B32, lead-free alloys.

B. Flux: ASTM B813, water flushable.

C. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP-5 Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.

2. Pressure rating at least equal to pipes to be joined.

3. End connections compatible with pipes to be joined.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

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

a. A.Y. McDonald Mfg. Co.
b. Capitol Manufacturing Company.
c. Central Plastics Company.
d. HART Industrial Unions, LLC.
e. Jomar Valve.
f. Matco-Norca.
g. WATTS.
h. Wilkins.
i. Zurn Industries, LLC.

2. Standard: ASSE 1079.

3. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C.

4. End Connections: Solder-joint, or press-connect joint, copper alloy and threaded ferrous.

PART 3 – EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance.

C. Install shutoff valve immediately upstream of each dielectric fitting.

D. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and coordinate with other services occupying that space.

H. Install piping to permit valve servicing.

I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

J. Install piping free of sags and bends.

K. Install fittings for changes in direction and branch connections.

L. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

M. Install sleeves for piping penetrations of walls, ceilings, and floors.

N. Install sleeve seals for piping penetrations of concrete walls and slabs.

O. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B828 or CDA's "Copper Tube Handbook."

F. Press-Connect Joints for Copper Tubing: Join copper tube and pressure-connect fittings with tools recommended by fitting manufacturer.

1. Mark proper insertion depth prior to making press connection.

G. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric couplings or nipples.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.

a. Individual, Straight, Horizontal Piping Runs: MSS Type 1, adjustable, steel clevis hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.

2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.

3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.

4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.

5. NPS 3 to NPS 4 (DN 80 to DN 100): 10 feet (3 m) with 1/2-inch (13-mm) rod.

F. Install supports for vertical copper tubing every 10 feet (3 m).

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.

2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.6 IDENTIFICATION

A. Identify system piping and components.

B. Label pressure piping with system operating pressure.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.

2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in “Piping Tests” Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.

2. Open shutoff valves to fully open position.

3. Open throttling valves to proper setting.

4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.

6. Remove and clean strainer screens. Close drain valves and replace drain plugs.

7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.

8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.9 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Repeat procedures if biological examination shows contamination.

e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.10 PIPING SCHEDULE

A. Unions may be used for aboveground piping joints unless otherwise indicated.

B. Aboveground domestic water piping, NPS 3 (DN 50) and smaller shall be the following:

1. Hard copper tube, ASTM B88, Type L (ASTM B88M, Type B) cast- or wrought-copper, solder-joint fittings; and soldered joints.

2. Hard copper tube, ASTM B88, Type L (ASTM B88M, Type B); copper press-connect fittings; and press-connect joints.

3.11 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves.

2. Throttling Duty: Use ball valves.

END OF SECTION 221116

SECTION 221119
PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes plumbing specialties for the following:

1. Water distribution systems.
2. Soil, waste, and vent systems.
3. Storm drainage systems.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

1. Water Distribution Piping: 125 psig.
2. Soil, Waste, and Vent Piping: 10-foot head of water.
3. Storm Drainage Piping: 10-foot head of water.

1.4 SUBMITTALS

A. Product Data: For each plumbing specialty indicated. Include rated capacities of selected equipment and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components, and piping and wiring connections for the following plumbing specialty products:

1. Backflow preventers.
2. Balancing valves.
3. Strainers.
4. Water hammer arresters.
5. Drain trap seals.
6. Wall hydrants.
7. Roof hydrants.
8. Washer-supply outlets.
9. Cleanouts.
10. Floor drains.

B. Reports: Specified in "Field Quality Control" Article.

C. Maintenance Data: For specialties to include in the maintenance manuals. Include the following:

1. Backflow preventers.

2. Water filters.

3. Hydrants.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, dimensional requirements, and characteristics of plumbing specialties and are based on the specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered.

B. Provide listing/approval stamp, label, or other marking on plumbing specialties made to specified standards.

C. Listing and Labeling: Provide electrically operated plumbing specialties specified in this Section that are listed and labeled.

1. Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.

D. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

E. Comply with NFPA 70, "National Electrical Code," for electrical components.

F. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic potable-water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Backflow Preventers:

a. Ames Co., Inc.
b. CMB Industries; Febco Div.
c. Apollo/Conbraco Industries, Inc.
d. Grinnell Corp.; Mueller Co. Marketing Group for Hersey Products Div.
e. Watts Industries, Inc.; Water Products Div.
f. Zurn Industries, Inc.; Wilkins Div.

2. Calibrated Balancing Valves:

a. Armstrong Pumps, Inc.
b. ITT Fluid Technology Corp.; ITT Bell & Gossett Div.

c. Taco, Inc.
d. Watts Industries, Inc.; Water Products Div.

3. Washer-Supply Outlets:

a. B & K Industries, Inc.
b. IMI Cash Valve.
c. Symmons Industries, Inc.
d. Watts Industries, Inc.; Water Products Div.

4. Wall Hydrants:

a. Josam Co.
b. Smith: Jay R. Smith Mfg. Co.
c. Tyler Pipe; Wade Div.
d. Watts Industries, Inc.; Water Products Div.
e. Woodford Manufacturing Co.
f. Zurn Industries, Inc.; Hydromechanics Div.

5. Roof Hydrants:

a. Mapa MPH-24-FP
b. J.R. Smith 5903
c. Woodford SRH-MS

6. Water Hammer Arresters:

a. Josam Co.
b. Smith: Jay R. Smith Mfg. Co.
c. Tyler Pipe; Wade Div.
d. Watts Industries, Inc.;
e. Zurn Industries, Inc.; Hydromechanics Div.

7. Drain Trap Seals:

a. J. R. Smith; Quad Close
b. Proset Trap Guard
c. Rectorseal Sure Seal
d. IPS Green Drain

8. Cleanouts:

a. Josam Co.
b. Mifab
c. Smith: Jay R. Smith Mfg. Co.
d. Tyler Pipe, Wade Div.
e. Watts
f. Zurn Industries, Inc., Hydromechanics Div.

9. Floor Drains:

a. Josam Co.
b. Mifab
c. Smith: Jay R. Smith Mfg. Co.
d. Tyler Pipe, Wade Div.
e. Watts

f. Zurn Industries, Inc., Hydromechanics Div.

2.2 BACKFLOW PREVENTERS

A. General: ASSE standard, backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.

1. 2-1/2-Inch NPS and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.

a. Interior Lining: AWWA C550 or FDA-approved, epoxy coating for backflow preventers having cast-iron or steel body.

2. Interior Components: Corrosion-resistant materials.

B. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; and test cocks with 2 positive-seating check valves.

1. Pressure Loss: 5 psig maximum, through middle one-third of flow range.

2.3 BALANCING VALVES

A. Calibrated Balancing Valves: Adjustable, with 2 readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.

1. 2-Inch NPS and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.

2. 2-Inch NPS and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.

3. 2-1/2-Inch NPS and Larger: Cast-iron, Y-pattern body with bronze disc and flanged or grooved ends.

2.4 STRAINERS

A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch round perforations, unless otherwise indicated.

1. Pressure Rating: 125-psig minimum steam working pressure, unless otherwise indicated.

2. 4-Inch NPS and Smaller: Bronze body, with female threaded ends. Include ball valve of place of blowoff plug.

2.5 OUTLET BOXES

A. General: Recessed-mounting outlet boxes with fittings complying with ASME A112.18.1M. Include box with faceplate, services indicated for equipment connections, and wood-blocking reinforcement.

B. Clothes Washer Outlet Boxes: With hose connections, drain, and the following:

1. Box and Faceplate: Plastic.

2. Shutoff Fittings: 2 hose bibbs.

3. Supply Fittings: Two 1/2-inch NPS gate, globe, or ball valves and 1/2-inch NPS copper, water tubing.

4. Drain Fitting: 2-inch NPS drainage piping P-trap with 2-inch NPS standpipe extending from floor to outlet box and 2-inch NPS waste.

C. Reinforcement: 2-by-4-inch- or 2-by-6-inch-, fire-retardant-treated-wood blocking between studs.

2.6 HYDRANTS

A. Wall Hydrants: ASME A112.21.3M or ASSE 1019, non-freeze, automatic draining, anti-backflow type, key operation, with 3/4- or 1-inch NPS threaded or solder-joint inlet, and ASME B1.20.7 garden-hose threads on outlet. Include operating key for each hydrant.

1. Type: Recessed.

2. Finish: Nickel bronze.

B. Roof Hydrants: ASSE 1057, non-freeze, automatic draining with 3/4-inch inlet and garden hose outlet. Include roof flashing and under-deck flange.

2.7 DRAIN TRAP SEALS

A. Drain Trap Seals: Fitting installs in drain body outlets to block sewer gases.

1. ASSE 1072 compliant.

2. HDPE or DBS plastic frame with silicon or EDPM sealing gasket.

2.8 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arrestors: Provide water hammer arrestors where indicated on drawings. Unit shall be constructed of stainless-steel bellows arranged in a pressurized expansion chamber and shall have lifetime warranty. Units shall have P.D.I symbol that relates to fixture unit rating.

2.9 CLEANOUT

A. Cleanout: Where plumbing specialties of this designation are indicated, provide products complying with the following and with the Fixture Schedule on the drawings.

1. Applicable Standard: ASME A112.36.2M. ASME A112.3.1.

2.10 FLOOR DRAIN

A. Floor Drain: Where plumbing specialties of this designation are indicated, provide products complying with the following and with Fixture Schedule on drawings:

1. Applicable Standard: ASME A112.21.1M. ASME A112.21.1M floor drain with ASME A112.14.1 backwater valve. ASME A112.3.1.

PART 3 - EXECUTION

3.1 PLUMBING SPECIALTY INSTALLATION

A. General: Install plumbing specialty components, connections, and devices according to manufacturer's written instructions.

B. Install backflow preventers of type, size, and capacity indicated, at each water-supply connection to mechanical equipment and systems, and to other equipment and water systems as indicated. Comply with authorities having jurisdiction. Locate backflow preventers in same room as connected equipment. Install air-gap fitting on units with atmospheric-vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.

C. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve, and where indicated.

D. Install wall hydrants with integral or field-installed vacuum breaker.

E. Install drain trap seals in drain body outlets as noted.

F. Install cleanouts in aboveground piping and building drain piping as indicated, and where not indicated, according to the following:

1. Size same as drainage piping up to 4-inch NPS. Use 4-inch NPS for larger drainage piping unless larger cleanout is indicated.

2. Locate at each change in direction of piping greater than 45 degrees.

3. Locate at minimum intervals of 50 feet for piping 3-inch NPS and smaller and 80 feet for larger piping.

4. Locate at base of each vertical soil and waste stack.

G. Install cleanout deck plates, of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.

H. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

I. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.

J. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor or as indicated. Size outlets as indicated.

K. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed.

L. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

M. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

N. Position floor drains for easy access and maintenance.

O. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.

P. Fasten recessed, wall-mounting plumbing specialties to reinforcement built into walls.

Q. Secure supplies to supports or substrate.

R. Install individual stop valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated.

S. Install water-supply stop valves in accessible locations.

T. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

U. Locate drainage piping as close as possible to bottom of floor slab supporting fixtures and drains.

V. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

W. Include blocking reinforcement for recessed and wall-mounting plumbing specialties.

X. Anchor roof hydrants to roof deck. Anchor in accordance with manufacturer's instructions. Coordinate flashing with roofing installer.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping connections between plumbing specialties and piping specified in other Division 22 sections.

2. Install piping connections indicated between appliances and equipment specified in other Sections; connect directly to plumbing piping systems.

3. Install piping connections indicated as indirect wastes from appliances and equipment specified in other Sections, to spill over receptors connected to plumbing piping systems.

B. Install hoses between plumbing specialties and appliances as required for connections.

C. Supply Runouts to Plumbing Specialties: Install hot- and cold-water-supply piping of sizes indicated, but not smaller than required by authorities having jurisdiction.

D. Drainage Runouts to Plumbing Specialties: Install drainage and vent piping, with approved trap, of sizes indicated, but not smaller than required by authorities having jurisdiction.

3.3 COMMISSIONING

A. Before startup, perform the following checks:

1. System tests are complete.

2. Damaged and defective specialties and accessories have been replaced or repaired.

3. Clear space is provided for servicing specialties.

B. Before operating systems, perform the following steps:

1. Close drain valves, hydrants, and hose bibbs.

2. Open general-duty valves to fully open position.
3. Remove and clean strainers.

4. Verify that drainage and vent piping are clear of obstructions. Flush with water until clear.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221119

SECTION 221123
WATER DISTRIBUTION PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of water distribution pumps for plumbing systems:

1. End-suction circulating pumps.

1.3 PUMP PERFORMANCE REQUIREMENTS

A. Pump Pressure Ratings: At least equal to system maximum operating pressure at point where installed.

B. Selection Point: All pump design operating points shall be left of the maximum efficiency point on the pump curve. Pump inlet fluid velocity shall not exceed 12 feet per second.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data including certified performance curves, weights (shipping, installed, and operating), furnished specialties, and accessories. Include startup instructions.

C. Wiring diagrams detailing wiring for power, signal, and control systems differentiating between manufacturer-installed wiring and field-installed wiring.

D. Product certificates signed by pump manufacturers certifying accuracies under specified operating conditions and compliance with specified requirements.

E. Maintenance data for each type and size pump specified to include in the Operating and Maintenance Manual.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with provisions of the following:

1. ASME B31.9 "Building Services Piping" for piping materials and installation.

2. UL 778 "Standard for Motor Operated Water Pumps" for construction requirements. Include UL listing and labeling.

3. NEMA MG 1 "Standard for Motors and Generators" for electric motors. Include NEMA listing and labeling.

4. NFPA 70 "National Electrical Code" for electrical components and installation.

B. Single-Source Responsibility: Obtain same type of pumps from a single manufacturer.

C. Single-Source Responsibility: Obtain same type of pumps from a single manufacturer with pumps, components, and accessories from a single source. Include responsibility and accountability to answer and resolve problems regarding compatibility, installation, performance, and acceptance of pumps.

D. Design Criteria: Drawings indicate sizes, profiles, connections, and dimensional requirements of pumps and are based on specific manufacturer types and models indicated. Pumps having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles do not change the design concept or intended performance as judged by the Design Professional. The burden of proof for equality of pumps is on the proposer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store pumps in a clean, dry location.

B. Retain shipping flange protective covers and protective coatings during storage.

C. Protect bearings and couplings against damage from sand, grit, or other foreign matter.

D. Comply with pump manufacturer's rigging instructions for handling and supporting.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. End-suction Circulating Pumps:

a. Armstrong Pumps, Inc.
b. Bell & Gossett Div., ITT Fluid Technology Corp.
c. Grundfos Pumps Corp.
d. Taco, Inc.

2.2 PUMPS, GENERAL

A. Water Distribution Pumps: Factory assembled and tested.

B. Capacities and Characteristics: As indicated.

C. Motors: NEMA MG 1; single, multiple, or variable speed with type of enclosure and electrical characteristics indicated. Include built-in thermal-overload protection and grease-lubricated ball bearings. Motors are non-overloading within full range of pump performance curves.

D. Finish: Manufacturer's standard paint applied to factory-assembled and -tested plumbing pump units before shipping.

E. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

2.3 END-SUCTION CIRCULATING PUMPS

A. General Description: End-suction centrifugal, single stage, rated for 125-psig minimum working pressure and 225 deg F continuous water temperature.

B. End-suction Circulator: Leakproof, End-suction, seal-less, volute-type pump. Include pump and motor. Lubricate sleeve bearing and cool motor by circulating pumped liquid through motor section. Isolate motor section from motor stator windings with a corrosion-resistant, nonmagnetic alloy liner.

1. Casing: Lead-free bronze; static O-ring seal to separate motor section from motor stator; and, flanged piping connections.

2. Impeller: Overhung, single-suction, closed or open metallic impeller.

3. Shaft and Sleeve: Ceramic shaft with carbon-steel bearing sleeve.

2.4 GENERAL-DUTY VALVES

A. Refer to other Division 22 sections for general-duty ball and check valves.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment foundations, and conditions with Installer present for compliance with requirements for installation and other conditions affecting performance of plumbing pumps. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine roughing-in of plumbing piping systems to verify actual locations of piping connections prior to pump installation.

3.2 INSTALLATION

A. Install pumps according to the manufacturer's written installation instructions.

B. Install pumps in locations indicated and arrange to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.

C. Provide 4” high concrete house keeping pad. Anchor pump to pad.

3.3 CONNECTIONS

A. Connect piping to pumps as indicated. Install valves that are same size as piping connecting to pumps.

B. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

C. Install shutoff valve on suction side of end-suction pumps and circulators.

D. Install check valve and throttling valve on discharge side of end-suction pumps and circulators.

E. Install pressure gages on suction and discharge side of pumps.

F. Install electrical connections for power, controls, and devices.

G. Electrical power and control wiring and connections are specified in Division 26 Sections.

3.4 FIELD QUALITY CONTROL

A. Check suction piping connections for tightness to avoid drawing air into pumps.

B. Pump Controls: Set pump controls for automatic start, stop, and alarm operation.

3.5 COMMISSIONING

A. Final Checks Before Startup: Perform the following preventive maintenance operations and checks before startup:

1. Disconnect couplings and check motors for proper rotation. Rotation shall match direction of rotation marked on pump casing.

2. Check that pumps are free to rotate by hand. Pumps for handling hot liquids shall be free to rotate with pump hot and cold. Do not operate pump if bound or if it drags even slightly until cause of trouble is determined and corrected.

3. Check that pump controls are correct for required application.

B. Starting procedure for pumps with shutoff power not exceeding safe motor power:

1. Prime pumps by opening suction valves and closing drains and prepare pumps for operation.

2. Open the liquid supply valves if pumps are so fitted.

3. Open circulating line valves if pumps should not be operated against dead shutoff.

4. Start motors.

5. Open discharge valves slowly.

6. Check general mechanical operation of pumps and motors.

7. Close circulating piping valves once there is sufficient flow through pumps to prevent overheating.

C. When pumps are to be started against closed check valves with discharge gate valves open, steps are same except open discharge gate valves some time before motors are started.

END OF SECTION 221123

SECTION 221125
DOMESTIC-WATER VARIABLE-SPEED BOOSTER PUMPS

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the following types of systems:

1. Duplex variable-speed booster pump packages.

1.2 REFERENCED STANDARDS

A. National Electrical Code Compliance: Components shall comply with NFPA 70, "National Electrical Code."

B. UL Compliance: Package shall be listed and labeled by UL and comply with UL QCZJ. "Packaged Pumping Systems.

C. UL Compliance: Controller shall be listed and labeled by UL, and comply with UL 508A, “Industrial Control Panels.”

D. NEMA Compliance: Electric motors and components shall be listed and labeled NEMA.

E. ANSI/HI 1.1-1.4, 1.6 – 2000, Nomenclature, Definitions, Applications, Operation and Testing.

F. NSF: Package shall be NSF/ANSI 61 & 372 Certified

1.3 SUBMITTALS

A. Product data: Furnish catalog information, manufacturers package curve, rated capacities, final impeller dimensions, and accessories provided for the product indicated.

1. A general arrangement drawing showing overall dimensions and all piping layouts.

2. Complete submittal data for all major equipment (pumps, motors, valves, electrical controls, etc.).

3. An electrical schematic, that provides power and control wiring.

4. Sequence of operation.

5. Indicate operating point of each pump on curves.

6. Furnish composite curve for booster package.

B. Operation and Maintenance Data: Provide installation, operation and maintenance manuals on all equipment, including assembly drawings as required for a complete explanation and description of all equipment.

1. Include installation instructions, maintenance instructions, assembly views, and replacement parts lists.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain pumps from a single manufacturer.

B. Each booster package shall be hydro-statically, and flow tested prior to shipment to verify system integrity.

C. Pumps shall operate:

1. At specified system fluid temperatures without vapor binding and cavitation.

2. With variable speed controller to maintain specified discharge pressure and prevent motor overloads.

D. The pump NPSH shall conform to the ANSI/HI 9.6.1-1998 standards for Centrifugal and Vertical Pumps for NPSH Margin.

E. Pump pressure ratings shall be at least equal to the system's maximum operating pressure at point where installed, but not less than specified.

F. ASME Compliance: Comply with ASME B31.9 for piping.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Provide certified equipment start-up and, when noted, an on site training session. Pump start-up shall be for the purpose of determining pump rotation, lubrication, voltage, and amperage readings. Start-up shall also include verification of proper electrical connections, pump's balance, and recording of discharge and suction gauge readings. A copy of the start-up report shall be submitted to the Engineer.

I. UL Compliance for Packaged Pumping Systems:

1. UL 508, "Industrial Control Equipment."

2. UL 778, "Motor-Operated Water Pumps."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's Shipping Preparation: Provide flange covers for protection during shipping.

B. Store booster in a dry indoor location.

C. Retain shipping flange protective covers and protective coatings during storage.

D. Protect bearings and couplings against damage from moisture, sand, grit, and other foreign matter.

PART 2 – PRODUCTS

2.1 DUPLEX, VARIABLE SPEED BOOSTER PUMPING PACKAGE

A. Subject to compliance with requirements below, provide pumps from one of the following manufacturers:

1. Basis of design: HYFAB
2. Bell & Gossett
3. Canariis
4. SynchroFlo
5. Tigerflow

B. General Description: Factory-assembled and tested variable speed domestic water pressure booster system with pumps, piping, isolation and check valves, controls, specialties and accessories mounted on a structural steel base. Pump and electrical protection shall be integrated into the pump controller package. The package shall be arranged in a compact design to allow it to be moved through a standard 36” doorway.

C. Pumps:

1. Pumps shall be close-coupled, end-suction, with volute housing mounted to allow "back pull out" service of the pump or motor without disturbing piping connections.

a. Casing Construction: Radially split, ASTM A48 CL20 cast iron suitable for 175 PSI working pressure. The pump volute shall be supplied with vent and drain tappings. Connections shall be female NPT. The casing shall be O-ring sealed to the seal housing.

b. Impeller Construction: Closed, single-suction, fabricated from cast bronze conforming to ASTM B 584, keyed to shaft and secured by a locking capscrew. Casing Wear Rings: Replaceable, bronze.

c. Pump Shaft and Sleeve Bearings: Steel shaft, with a replaceable bronze shaft sleeve completely covering the wetted area of the shaft under the seal.

d. Seals: Mechanical seals consisting of carbon rotating ring, stainless steel spring, ceramic seat, and flexible bellows and gasket.

e. Motor: Motor shall be NEMA design JM of size and type scheduled on drawings. Motors shall have a 1.15 service factor. Pump motors shall be secured to mounting frame. Booster designs with pump motors supported from the volute only shall not be acceptable.

f. Each pump shall be tested by its manufacturer at shut off and at a minimum of two other operating points at operating speed to verify performance.

D. Check valves: Angle style, pilot operated check valves shall be installed on the discharge of each pump. The valve shall have a fusion bonded epoxy coated ductile iron body with a bronze disc. The check valves shall be able to be serviced or rebuilt without removing them from the pressure booster. Direct acting check valves are not acceptable.

E. Isolation Valves: Two-piece, bronze body, full port ball valves shall be provided to isolate each pump and check valve.

F. Thermal protection: Self-contained thermal-relief valves factory set to discharge at 125°F shall be mounted on each pump.

G. Piping: All piping shall be constructed from Type 304 stainless steel. Suction and Discharge headers shall be designed and constructed for minimal friction loss.

H. Pressure gauges: Pressure gauges shall be liquid filled, bourdon tube type. Gauges shall be supplied for both the suction and discharge headers.

I. Package Base: The pressure booster base shall be designed and fabricated to provide proper structural support for all attached equipment and provide for anchorage to the structure. The base shall include a rigid structural member for pump and motor support. Main members shall be constructed from heavy weight A-36 structural steel members with reinforcing channels for larger boosters. Steel base shall be painted with machinery enamel.

J. Control Panel: Manufacturer shall provide a UL-508A listed complete electrical system including main disconnect, variable speed pump controller, pressure transducers, instrumentation and controls to automatically start, stop and modulate pump speed to smoothly, efficiently and reliably provide pump variable flow rates at a constant discharge pressure. The booster package shall include full pump, motor and drive safety features required to protect the equipment and piping system.

1. Main Control Panel: A door-operated non fused main disconnect shall be provided which shall remove power from the entire pressure booster when switched off. Each Variable Speed Drive (VFD)/Motor shall be protected by a molded case circuit breaker or MSP enclosed in the main control panel.

2. Motor Controller: NEMA ICS 7.1 variable-frequency, variable torque, solid-state pulse-width modulating type. VFD protective features shall include:

    a. Ground fault

    b. Short Circuit

    c. Motor overload

3. Suction and discharge pressure transducers.

    a. Pressure transducers shall be utilized for providing all pressure signals for the pump control logic. Pressure switches are not acceptable.

    b. Pressure transducer shall be a solid-state bonded strain gage type with an accuracy of plus/minus 1 %. Transducer shall be constructed of non-ferrous metal suitable for used with domestic water. Pressure transducers constructed of plastic are not acceptable.

    c. Transducer shall be rated for package discharge and suction pressures as shown on submittal.

    d. Pressure transducer shall utilize a Packard type connector to prevent moisture intrusion.

4. Temperature Sensor

   a. A NTC thermistor or RTD shall be used for sensing the booster pumps' discharge temperatures for temperature limit control logic. Thermostats are not acceptable.

   b. The temperature sensor shall be of the immersion type and shall be immersed in water from the pumps' discharge. It shall be sealed of by a reusable compression type fitting allowing easy removal and insertion.

5. Controller: Touchscreen variable speed pump logic controller in a NEMA 1 enclosure with door operated disconnect to include power distribution and overload protection for each AFD and the following control features:

   a. Unit shall utilize user-friendly front panel programming that displays parameters in clear text.

   b. Display shall show all system variables in plain English.

   c. Program settings shall be changeable and stored in non-volatile memory. Program settings shall be retained in memory in the event of loss of power to the controller, without the use of a backup battery.

   d. System operating pressure shall be clearly displayed in PSI or feet of head for ease of use and to provide an operator friendly interface.

   e. Additional parameters, where applicable, shall be displayed in units consistent with pumping systems.

   f. The booster shall include variable head reset feature.

   g. The settings and program in whole or part may be locked out with the use of an operator selectable password. Standard system settings shall include at a minimum the following functions:

      1) Low suction pressure shutdown with auto restart

      2) High discharge pressure shutdown with lockout

      3) High discharge temperature shutdown

      4) Pump failure alarm

      5) Constant pressure setting with variable flow capability

      6) Multiple pump operation with alternation

      7) Pump starting point with allowable, adjustable pressure drop

      8) Minimum speed

      9) No flow standby

6. Hydro-pneumatic Tank:

   a. Furnish hydro-pneumatic tank separately for field installation.

   b. Furnish tank of size pressure rating and construction specified on pressure booster schedule.

   c. Furnish hydro-pneumatic tank connection on discharge header with union, isolation valve and drain valve on discharge header of packaged pressure booster.

7. Sequence of Operation:

   a. The pump controller shall receive a 4-20mA signal from each pressure transducer.

   b. The pressure transducer shall monitor system pressure and provide an analog signal to the pump control software and allow the VFD motor controller to provide a variable Volts/Hz output to the motor.

   c. Whenever the pressure drops below the set system pressure, the lead pump shall start and run at speed required to maintain system pressure setpoint. If the pressure setpoint cannot be maintained by one pump, the lag pump shall start to provide the extra flow and pressure automatically.

   d. When demand decreases to a level which can be met by one pump and an adjustable minimum run-timer has elapsed, the lag pump will be stopped.

   e. The lead pump shall alternate based on elapsed run time.

   f. When the system experiences low demand the controller shall test for a no flow condition without the use of external switches or controls. The controller will stop the lead pump after verifying a zero-demand condition exists and a minimum run-timer has elapsed. The hydro-pneumatic tank shall supply water to the system until the pressure falls below the restart pressure, at which point the lead pump shall restart

   g. All program settings shall be based on centrifugal pump language.

   h. Program settings shall be password protected. With proper password entry, settings shall be field adjustable to allow changes by the user.

   i. Pressure Control: To meet ASHRAE 90.1-2010 standard and building code requirement, the variable speed pressure booster shall employ logic that recalculates the setpoint based on the actual system friction loss between booster discharge and the remote critical fixture. The controller will monitor system demand and continuously change the discharge pressure setpoint based on flow. The controlling set point and flow shall be displayed on the digital screen.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment foundations, and conditions, for compliance with requirements for installation tolerances and other conditions affecting performance of pumps.

B. Examine rough-in for piping systems to verify actual locations of piping connections prior to installation.

C. Examine equipment foundations and/or inertia bases for suitable conditions where pumps are to be installed.

D. Correct unsatisfactory conditions prior to installation of pumps.

3.2 INSTALLATION

A. General: Comply with the ANSI/HI 1.4-2000 and manufacturer's written installation and alignment instructions.

B. Refer to the drawings for details of booster installation.

C. Install booster package in specified location. Provide access for periodic maintenance, including removal of motors, impellers, and accessories.

D. Equipment Mounting: Install booster pumps on concrete base using elastomeric pads.

1. 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.

2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. Install anchor bolts to elevations required for proper attachment to supported equipment.

E. Support connected domestic water-piping, so weight of piping is not supported by booster pumps.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Division 22. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect domestic-water piping to booster pumps. Install suction and discharge piping equal to or greater than size of system suction and discharge header piping.

1. Install shutoff valves on piping connections to booster-pump suction and discharge header piping. Install ball valves same size as suction and discharge header piping.

2. Install union, flanged, or grooved-joint connections on suction and discharge header piping at connection to domestic-water piping.

3. Install valved bypass, same size as and between piping, at connections to booster-pump suction and discharge header piping. Install flexible connectors, same size as piping, on piping connections to booster-pump suction and discharge header piping.

4. Install piping adjacent to booster pumps to allow service and maintenance.

C. Install electrical connections for power, controls, and devices.

D. Coordinate electrical power and control wiring and connections with electrical division.

3.4 IDENTIFICATION

A. Identify system components.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Perform visual and mechanical inspection.

2. Leak Test: After installation, charge booster pump and test for leaks. Repair leaks and retest until no leaks exist.

3. Operational Test: After electrical circuitry has been energized, start booster pumps to confirm proper motor rotation and booster-pump operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Pumps and controls will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust booster pumps to function smoothly and lubricate as recommended by the manufacturer.

B. Adjust pressure set points.

C. Occupancy Adjustments: When requested within 12 months of date of Material Completion, provide on-site assistance in adjusting booster pump to suit actual occupied conditions. Provide up to two visits to the project during other-than-normal occupancy hours for this purpose.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain booster pumps.

END OF SECTION 221125

SECTION 221316
DRAINAGE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes sanitary drainage and vent piping, and storm drainage piping inside building and to locations indicated.

1.3 DEFINITIONS

A. Sewerage Piping: Building sewer piping outside building that conveys sanitary sewage from building.

B. Storm Drainage Piping: Building sewer piping outside building that conveys storm drainage from building.

C. Service Entrance Piping: Drainage piping at entry into building between outside building sewer piping and inside drainage piping.

D. Soil, Waste and Vent Piping: Piping inside building that conveys waste water and vapors from fixtures and equipment throughout the building.

E. Force-Main Piping: Drainage piping, under pressure.

F. The following are industry abbreviations for plastic and other piping materials:

1. PVC: Polyvinyl chloride.

G. Underground Piping: Piping located below slab or grade and to within 6-inches above slab or grade.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

1. Soil, Waste, and Vent Systems: 10-foot head of water.

2. Sewerage Piping: 10-foot head of water.

3. Storm Drainage Systems: 10-foot head of water.

4. Sewage, Force-Main Piping Systems: 80 psig.

1.5 SUBMITTALS

A. Product Data: For each plumbing specialty indicated. Indicate materials, finishes, dimensions, and methods of assembly of components for the following plumbing specialty products:

1. Pipe and Fittings.

2. Pipe Couplings.

3. Test Results and Reports: Specified in "Field Quality Control" Article..

1.6 QUALITY ASSURANCE

A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic piping components. Include “NSF” marking for plastic drain and sewerage piping.

PART 2 - PRODUCTS

2.1 PIPES AND TUBES

A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.

B. PVC Plastic Pipe: ASTM D 2665, Schedule 40.

2.2 PIPE AND TUBE FITTINGS

A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.

B. Threaded-Fitting, End Connections: ASME B1.20.1.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311 drain, waste, and vent pipe patterns.

2.3 JOINING MATERIALS

A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.

B. Refer to Division 22 Section for commonly used joining materials.

C. Couplings: Assemblies with combination of clamps, gaskets, sleeves, and threaded or flanged parts; made by piping system manufacturer for joining system piping.

D. Transition Couplings: Coupling or other manufactured fitting same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined. Use the following:

1. Heavy Duty, Stainless-Steel Couplings: Shall comply with ASTM C 1540 with ASTM C 564, Type 304, stainless-steel corrugated shield; stainless-steel bands. Include sealing sleeve; corrosion-resistant fasteners, and ASTM C 564 rubber sleeve or gasket with integral, center pipe stop

a. Clamp Width: 3 inches wide with 4 clamps, for piping 12 through 4-inch NPS.

b. Clamp Width: 4 inches wide with 6 clamps, for piping 6 through 10-inch width.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

B. Soil, Waste, and Vent Piping: Use the following:

1. 12-Inch NPS or smaller: PVC plastic pipe, PVC socket fittings, and solvent-cemented joints.

C. Storm Drainage Piping: Use the following:

1. 12-Inch NPS and smaller: PVC plastic pipe, PVC socket fittings, and solvent-cemented joints.

D. Aboveground, Sewage Force Mains: Use the following:

1. 3-Inch NPS or smaller: Schedule 40 PVC plastic pipe, PVC socket fittings, and solvent-cemented joints.

3.2 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves.

B. Plastic valves may be used with plastic piping systems.

3.3 PIPING INSTALLATION, GENERAL

A. Refer to Division 22 Section for basic piping installation.

3.4 SERVICE ENTRANCE PIPING INSTALLATION

A. Extend building sanitary drain piping and connect to sanitary sewer piping in sizes and locations indicated for service entrances into building. Install cleanout and extension to grade, at connections of building sanitary drains with building sanitary sewers.

B. Extend building storm drain piping and connect to storm sewer piping in sizes and locations indicated for service entrances into building. Install cleanout and extension to grade, at connections of building storm drains and building storm sewers.

C. Install sleeve at each service entrance pipe penetration through foundation wall. Refer to Division 22 Section for sleeves.

3.5 DRAINAGE AND VENT PIPING INSTALLATION

A. Make changes in direction for drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back-to-back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not make change in direction of flow greater than 90 degrees. Use proper size of standard increasers and reducers if different sizes of piping are connected. Reducing size of drainage piping in direction of flow is prohibited.

B. Lay buried building drain piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

C. Install drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Sanitary Building Drain: 2 percent downward in direction of flow for piping 2-inch NPS and smaller; 1 percent downward in direction of flow for piping 3-inch NPS and larger.

2. Storm Building Drain: 1 percent downward in direction of flow.

3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

D. Sleeves are not required for cast-iron soil piping passing through concrete slab on grade if slab is without membrane waterproofing.

E. Install PVC plastic drainage piping according to ASTM D 2665.

F. Install underground PVC plastic drainage piping according to ASTM D 2321.

3.6 JOINT CONSTRUCTION

A. Refer to other Division 22 sections for basic piping joint construction.

B. PVC Piping Joints: Join drainage piping according to ASTM D 2665.

C. ABS to PVC Piping Transition Joints: Make non-pressure transition joints between ABS and PVC drainage components, using fittings and procedure according to ASTM D 3138.

D. Handling of Solvent Cements, Primers, and Cleaners: Comply with procedures in ASTM F 402 for safe handling during joining of plastic pipe and fittings.

3.7 VALVE INSTALLATION

A. Shutoff Valves: Install shutoff valve on each pump discharge and where indicated. Use gate or ball valves for piping 2-inch NPS and smaller. Use gate or butterfly valves for piping 2-1/2-inch NPS and larger.

B. Check Valves: Install swing check valve on each pump discharge, downstream from shutoff valve.

3.8 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 22 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Riser clamps, MSS Type 8 or Type 42, for vertical runs.

2. Adjustable steel clevis hangers, MSS Type 1, for individual, straight, horizontal runs.

B. Install supports according to Division 22 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for PVC plastic piping with the following maximum spacing and minimum rod diameters:

1. 1-1/2- and 2-Inch NPS: Maximum horizontal spacing, 48 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.

2. 4-Inch NPS: Maximum horizontal spacing, 48 inches with 5/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.

3. 6-Inch NPS: Maximum horizontal spacing, 48 inches with 3/4-inch minimum rod diameter; maximum vertical spacing, 48 inches.

4. 8- through 12-Inch NPS: Maximum horizontal spacing, 48 inches with 7/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.

F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.9 CONNECTIONS

A. Connect service entrance piping to exterior sewerage and drainage piping. Use transition fitting to join dissimilar piping materials.

B. Connect drainage piping to service entrance piping, and extend to and connect to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.

2. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.

3. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections 2-1/2-inch NPS and larger.

C. Connect force-main piping to service entrance piping, and extend to and connect to the following:

1. Sump Pumps: Connect force-main piping to sump-pump discharge.

3.10 ACCESSORIES INSTALLATION

A. Install accessories according to manufacturer's written instructions and as indicated.

3.11 FIELD QUALITY CONTROL

A. Inspect drainage and vent piping as follows:

1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

a. Roughing-In Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedure, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.

3. Roughing-In Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10 feet of head. Water level must not drop from 15 minutes before inspection starts through completion of inspection. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gas tight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects using new materials and retest piping or portion thereof until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.12 CLEANING AND PROTECTING

A. Clean interior of piping system. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221316

SECTION 221416
NATURAL GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes piping, specialties, and accessories for natural gas systems within building and to gas meters.

B. This Section includes piping, specialties, and accessories for natural gas systems within building and to point indicated.

1.3 DEFINITIONS

A. Low-Pressure Natural Gas Piping: Operating pressure of 0.5 psig or less.

B. Medium-Pressure Natural Gas Piping: Operating pressure greater than 0.5 psig, but not greater than 2 psig.

C. High-Pressure Natural Gas Piping: Operating pressure greater than 2 psig, but not greater than 5 psig.

D. Gas Service: Pipe from gas main or other source to gas point of delivery for building being served. Piping includes gas service piping, gas valve, service pressure regulator, meter bar or meter support, and gas meter.

E. Gas Delivery Point: Gas meter or service pressure regulator outlet, or gas service valve if gas meter is not provided.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. Minimum Working-Pressure Ratings: Except where otherwise indicated, minimum pressure requirements are as follows:

1. Low-Pressure Natural Gas Piping: 2 psig.

2. Medium-Pressure Natural Gas Piping: 10 psig.

3. High-Pressure Natural Gas Piping: 20 psig.

B. Approximate values of natural gas supplied for these systems are as follows:

1. Heating Value: 1000 Btu/cu. ft.

2. Specific Gravity: 0.6.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data for each type of natural gas specialty and special-duty valve. Include pressure rating, rated capacity, and settings of selected models.

C. Coordination Drawings for natural gas piping, including required clearances and relationship to other services for same work areas.

D. Test reports specified in "Field Quality Control" Article in Part 3.

E. Maintenance data for natural gas specialties and special-duty valves to include in the operation and maintenance manual.

1.6 QUALITY ASSURANCE

A. Comply with International Fuel Gas Code and NFPA 54, "National Fuel Gas Code," for gas piping materials and components; installations; and inspecting, testing, and purging.

B. Comply with NFPA 70, "National Electrical Code," for electrical connections between wiring and electrically operated control devices.

C. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.

D. Listing and Labeling: Provide equipment and accessories specified in this Section that are listed and labeled.

1. Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.

E. Product Options: Drawings indicate size, profiles, connections, dimensional requirements, and characteristics of natural gas piping equipment, specialties, and accessories and are based on specific types and models indicated. Other manufacturers' equipment and components with equal performance characteristics may be considered.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify gas supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

1.8 SEQUENCING AND SCHEDULING

A. Notification of Interruption of Service: Notify each affected user when gas supply will be turned off.

B. Work Interruptions: Leave gas piping systems in safe condition when interruptions in work occur during repairs or alterations to existing gas piping systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Gas Ball Valves, 2-Inch NPS and Smaller:

    a. Jomar Valve
    b. Legend Valve
    c. Maxitrol Co.
    d. McDonald: A.Y. McDonald Mfg. Co.
    e. Milwaukee Valve Co., Inc.
    f. National Meter

2. Gas Valves, 2-1/2-Inch NPS and Larger:

    a. Mueller Steam Specialty Div.
    b. Milliken Valve Co., Inc.
    c. Nordstrom Valves, Inc.
    d. Olson Technologies, Inc.; Homestead Valve Div.

3. Gas Pressure Regulators:

    a. American Meter Co.
    b. Fisher Controls International, Inc.
    c. Maxitrol Co.
    d. Pietro Fiorentini
    e. Richards Industries, Inc.; Jordan Valve Div.

4. Pre-sleeved corrugated stainless-steel piping:

    a. Gastite
    b. Omegaflex
    c. TracPipe

2.2 PIPES AND TUBES

A. Steel Pipe: ASTM A 53; Type E, electric-resistance welded or Type S, seamless; Grade B; Schedule 40; black. All exposed piping shall be brushed, primed and painted.

B. Stainless-Steel Corrugated Tube: AGA LC 1 and AGA LC 1a, corrugated. Pre-sleeved for under slab applications.

2.3 PIPE AND TUBE FITTINGS

A. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends conforming to ASME B1.20.1.

B. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends conforming to ASME B1.20.1.

C. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Classes 125 and 250.

D. Steel Fittings: ASME B16.9, wrought steel, butt-welding type; and ASME B16.11, forged steel.

E. Steel Flanges and Flanged Fittings: ASME B16.5.

F. Stainless-Steel Tube Fittings: AGA LC 1 and AGA LC 1a, brass with threaded ends conforming to ASME B1.20.1 or mechanical couplings, made by or for manufacturer of corrugated stainless-steel tubing.

G. Stainless-Steel Tube Manifolds: Suitable for use with corrugated stainless-steel tubing.

H. Transition Fittings: Type, material, and end connections to match piping being joined.

2.4 JOINING MATERIALS

A. Common Joining Materials: Refer to Division 22 Sections for joining materials not included in this Section.

B. Joint Compound and Tape: Suitable for natural gas.

C. Gasket Material: Thickness, material, and type suitable for natural gas.

2.5 VALVES

A. Gas Valves, 3-Inch NPS and Smaller: 250 psig WOG minimum, equivalent to ASME B16.33, bronze body with chrome plated brass ball and polytetrafluoroethylene (PTFE) seats and seals Include lever handle or flat head and threaded ends conforming to ASME B1.20.1.

B. Gas Valves, 4-Inch NPS and Larger: MSS SP-78, Class 125 or Class 175 WOG, nonlubricated-plug type with polytetrafluoroethylene (PTFE) lining or sleeve, semisteel body, wrench operated, with flanged ends.

2.6 PIPING SPECIALTIES

A. Gas Pressure Regulators: ANSI Z21.18, single-stage, steel-jacketed, corrosion-resistant pressure regulators. Include atmospheric vent, elevation compensator, with threaded ends conforming to ASME B1.20.1 for 2-inch NPS and smaller and flanged ends for 2-1/2-inch NPS and larger. Regulator pressure ratings, inlet and outlet pressures, and flow volume in cubic feet per hour of natural gas at specific gravity are as indicated.

1. Service Pressure Regulators: Inlet pressure rating not less than natural gas distribution system service pressure.

2. Line Gas Pressure Regulators: Inlet pressure rating not less than system pressure.

3. Appliance Gas Pressure Regulators: Inlet pressure rating not less than system pressure, with capacity and pressure setting matching appliance.

4. Gas Pressure Regulator Vents: Factory- or field-installed corrosion-resistant screen in opening when not connected to vent piping.

PART 3 - EXECUTION

3.1 PREPARATION

A. Close equipment shutoff valves before turning off gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

B. Comply with NFPA 54 Paragraph "Prevention of Accidental Ignition."

3.2 SERVICE ENTRANCE PIPING

A. Extend natural gas piping and connect to gas distribution system (gas service) piping in location and size indicated for gas service entrance to building.

B. Install shutoff valve, downstream from gas meter, outside building at gas service entrance.

3.3 GAS METER

A. Gas distribution system piping, service pressure regulator and gas meter will be provided by gas utility under this section. All fees for meter installation and connection shall be borne under this section.

3.4 PIPING APPLICATIONS

A. General: Flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating may be used in applications below, except where otherwise indicated.

B. Low-Pressure, 0.5 psig or Less, Natural Gas Systems: Use the following:

1. Gas distribution system piping, service pressure regulator, and gas meter to be provided and installed by gas utility under this section. All fees and costs for all materials and labor shall be borne by the contractor for the complete natural gas service system including (but not limited to) gas meter, gas entrance and distribution system piping and gas service pressure regulator.

2. 2-Inch NPS and Smaller: Steel pipe, malleable-iron threaded fittings, and threaded joints.

3. 2-1/2 Inch NPS and Larger: Steel pipe, butt-welding fittings, and welded joints.

C. Medium-Pressure, 0.5 to 2 psig, Natural Gas Systems: Use the following:

1. 1-Inch NPS and Smaller: Steel pipe, butt-welding fittings, and welded joints.

2. 1-1/4-Inch NPS and Larger: Steel pipe, butt-welding fittings, and welded joints.

D. High-Pressure, above 2 to 5 psig, Natural Gas Systems: Steel pipe, butt-welding fittings, and welded joints.

E. Underground Natural Gas Systems, All Pressures: Flexible, stainless steel tubing, matching brass fittings, and threaded joints; pre-sleeved in polyethylene conduit.

3.5 VALVE APPLICATIONS

A. Use valves for shutoff to appliances with 2-inch NPS or smaller low-pressure gas supply.

B. Use gas valves for shutoff to appliances with 2-1/2-inch NPS or larger low-pressure gas supply and all sizes for medium-pressure gas supply.

C. Use gas valves of sizes indicated for gas service piping, meters, mains, and where indicated.

3.6 PIPING INSTALLATIONS

A. Refer to Division 22 Sections for basic piping installation requirements.

B. Concealed Locations: Except as specified below, install concealed gas piping in airtight conduit constructed of Schedule 40, seamless, black steel pipe with welded joints. Vent conduit to outside and terminate with screened vent cap.

1. Above-Ceiling Locations: Gas piping may be installed in accessible spaces, subject to approval of authorities having jurisdiction, whether or not such spaces are used as plenums. Do not locate valves in such spaces.

2. In Floors: Gas piping with welded joints and protective wrapping specified in "Protective Coating" Article in Part 2 may be installed in floors, subject to approval of authorities having jurisdiction. Surround piping cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.

3. In Floor Channels: Gas piping may be installed in floor channels, subject to approval of authorities having jurisdiction. Channels must have cover and be open to space above cover for ventilation.

4. In Partitions: Do not install concealed piping in solid partitions. Protect tubing from physical damage when installed inside partitions or hollow walls.

    a. Exception: Tubing passing through partitions or walls.

5. In Walls: Gas piping with welded joints and protective wrapping specified in "Protective Coating" Article in Part 2 may be installed in masonry walls, subject to approval of authorities having jurisdiction.

6. Prohibited Locations: Do not install gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.

    a. Exception: Accessible above-ceiling space specified above.

C. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of gas meters. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate would be subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

D. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, except where indicated to be exposed to view.

E. Install gas piping at uniform grade of 0.1 percent slope upward toward risers.

F. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

G. Connect branch piping from top or side of horizontal piping.

H. Install unions in pipes 2-inch NPS and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

I. Install corrugated stainless-steel tube and fittings according to manufacturer's written instructions. Vent sleeved portion to exterior, turn vent down and screen outlet.

J. Install dielectric fittings (unions and flanges) with ferrous and brass or bronze end connections, separated by insulating material, where piping of dissimilar metals is joined.

K. Install dielectric fittings (unions and flanges) with 2 ferrous end connections, separated by insulating material, at outlet from gas meter and, where indicated, for ferrous piping.

L. Install flanges on valves, specialties, and equipment having 2-1/2-inch NPS and larger connections.

M. Anchor piping to ensure proper direction of piping expansion and contraction. Install expansion joints, expansion loops, and pipe guides as indicated.

N. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

3.7 JOINT CONSTRUCTION

A. Refer to Division 22 Sections for basic piping joint construction.

B. Use materials suitable for natural gas service.

3.8 VALVE INSTALLATION

A. Install valves in accessible locations, protected from damage.

B. Install gas valve upstream from each gas pressure regulator. Where 2 gas pressure regulators are installed in series, valve is not required at second regulator.

C. Install pressure relief or pressure-limiting devices so they can be readily operated to determine if valve is free; test to determine pressure at which they will operate; and examine for leakage when in closed position.

3.9 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 22 Sections for pipe hanger and support devices.

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. 1/2-Inch NPS: Maximum span, 72 inches; minimum rod size, 3/8 inch.

2. 3/4- and 1-Inch NPS: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3. 1-1/4-Inch NPS: Maximum span, 108 inches; minimum rod size, 3/8 inch.

4. 1-1/2- and 2-Inch NPS: Maximum span, 108 inches; minimum rod size, 3/8 inch.

5. 2-1/2- to 3-1/2-Inch NPS: Maximum span, 10 feet; minimum rod size, 1/2 inch.

6. 4-Inch NPS and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

C. Support horizontal, corrugated stainless-steel tubing according to manufacturer's written instructions.

D. Support vertical pipe and tube at each floor.

3.10 CONNECTIONS

A. Install gas piping next to equipment and appliances using gas to allow service and maintenance.

B. Connect gas piping to equipment and appliances using gas with shutoff valves and unions. Install gas valve upstream from and within 72 inches of each appliance using gas. Install union or flanged connection downstream from valve. Include flexible connectors when indicated.

C. Sediment Traps: Install tee fitting with capped nipple in bottom forming drip, as close as practical to inlet for appliance using gas.

D. Electrical Connections: Wiring is specified in Division 26 Sections.

3.11 ELECTRICAL BONDING AND GROUNDING

A. Install aboveground portions of natural gas piping systems that are upstream from equipment shutoff valves, electrically continuous, and bonded to grounding electrode according to NFPA 70.

B. Do not use gas piping as grounding electrode.

3.12 PAINTING

A. Exterior Applications: Paint all exposed steel surfaces of piping and supports with one coat of primer and two coats of yellow enamel.

3.13 FIELD QUALITY CONTROL

A. Inspect, test, and purge piping according to "Gas Piping Inspection, Testing, and Purging" in NFPA 54 and International Fuel Gas Code.

B. Test piping for minimum of two hours. Test pressures shall be equal to twice the minimum working pressure ratings shown in section 221416, paragraph 1.4. A.

C. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

D. Report test results promptly and in writing to the Design Professional and authorities having jurisdiction.

E. Verify capacities and pressure ratings of gas meters, regulators, valves, and specialties.

F. Verify correct pressure settings for pressure regulators.

G. Verify that specified piping tests are complete.

3.14 ADJUSTING

A. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

END OF SECTION 221416

SECTION 224000
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes plumbing fixtures and trim, faucets, other fittings, and related components.

1.3 DEFINITIONS

A. Accessible: Plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped, disabled, and elderly people.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and drains and tailpieces, traps and waste pipes. Pipe fittings, tube fittings, and general-duty valves are included where indicated.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data for each plumbing fixture category and type specified. Include selected fixture, trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

C. Wiring diagrams from manufacturer for electrically operated units.

D. Maintenance data for plumbing fixtures and components to include in the operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category from one source and by a single manufacturer.

1. Exception: Where fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for this category.

B. Regulatory Requirements: Comply with requirements of 2010 ADA Standards for Accessible Design; regarding plumbing fixtures for physically handicapped people.

C. Energy Policy Act Requirements: Comply with requirements of Public Law 102-486, "Energy Policy Act," regarding water flow rate and water consumption of plumbing fixtures.

D. Listing and Labeling: Provide electrically operated fixtures and components specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

F. Product Options: Drawings indicate size, profiles, dimensional requirements, and characteristics of plumbing fixtures and are based on specific types and models indicated. Other manufacturers' fixtures with equal performance characteristics may be considered.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver plumbing fixtures in manufacturer's protective packing, crating, and covering.

B. Store plumbing fixtures on elevated platforms in dry location.

1.7 PROJECT CONDITIONS

A. Field Measurements: Coordinate roughing-in and final fixture locations and verify that plumbing fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURE STANDARDS

A. Comply with applicable standards below and other requirements specified.

1. Electric Water Coolers: ARI 1010 and UL 399.

2. National Sanitation Foundation Construction: NSF 2.

3. Plastic Shower Enclosures: ANSI Z124.2 and ANSI Z124.2a.

4. Slip-Resistant Bathing Surfaces: ASTM F 462.

5. Stainless-Steel Fixtures Other than Service Sinks: ASME A112.19.3M.

6. Vitreous-China Fixtures: ASME A112.19.2M.

7. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5 and ASSE 1037.

2.2 LAVATORY/SINK FAUCET STANDARDS

A. Comply with ASME A112.18.1M and other requirements specified for lavatory, sink, and similar-type-fixture faucet fittings. Include hot- and cold-water indicators; 2.0-gpm-maximum flow rate; and polished, chrome-plated finish; except where otherwise indicated. Coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.

1. Diverter Valves for Faucets with Hose Spray: ASSE 1025.

2. Faucet Hose: ASTM D 3901.

3. Hose-Connection Vacuum Breakers: ASSE 1011.

4. Hose-Coupling Threads: ASME B1.20.7.

5. Integral, Atmospheric Vacuum Breakers: ASSE 1001.

6. Pipe Threads: ASME B1.20.1.

2.3 SHOWER FAUCET STANDARDS

A. Comply with ASME A112.18.1M and other requirements specified for shower faucet fittings. Include hot- and cold-water indicators; 2.5-gpm-maximum flow rate; and polished, chrome-plated finish; except where otherwise indicated. Coordinate faucet inlets with supplies and outlet with diverter valve and shower head, arm, and flange.

1. Hand-Held Showers: ASSE 1014.

2. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.

3. Hose-Coupling Threads: ASME B1.20.1 or ASME B1.20.7.

4. Pipe Threads: ASME B1.20.1.

5. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

2.4 MISCELLANEOUS FITTING STANDARDS

A. Comply with ASME A112.18.1M and other requirements specified for fittings, other than faucets. Include polished, chrome-plated finish, except where otherwise indicated. Coordinate fittings with other components and connectors.

1. Atmospheric Vacuum Breakers: ASSE 1001.

2. Automatic Flow Restrictors: ASSE 1028.

3. Brass and Copper, Supplies and Tubular Brass: ASME A112.18.1M.

4. Fixed Flow Restrictors: ASSE 1034.

5. Manual-Operation Flushometers: ASSE 1037.

2.5 MISCELLANEOUS COMPONENT STANDARDS

A. Comply with applicable standards below and other requirements specified for components for plumbing fixtures, equipment, and appliances.

1. Floor Drains: ASME A112.21.1M.

2. Hose-Coupling Threads: ASME B1.20.7.

3. Pipe Threads: ASME B1.20.1.

4. Plastic Toilet Seats: ANSI Z124.5.

5. Supply and Drain Insulation Kits: CABO A117.1.

2.6 FITTINGS

A. Supplies:

1. Manufacturers and Models:

a. A. Y. McDonald 2082 Series
b. B&K 490 Series
c. Brasscraft KTCS Series
d. McGuire BV Series
e. Watts 894 Series
f. Zurn 8800 Series

2. Supply Inlet: Brass pipe or copper tube, size required for final connection.

3. Supply Stops: Chrome-plated brass, angle; chrome-plated brass ball; quarter-turn operation; ½" compression inlet and 3/8" o.d. compression outlet; same size as supply inlet and with outlet matching supply riser, chrome handle.

4. Supply Risers: 3/8" NPS flexible copper tube with knob end. Use chrome-plated tube for exposed applications.

B. Traps and Wastes:

1. Manufacturers:

a. McGuire
b. EBC
c. Dearborne
d. Watts
e. Zurn

2. Traps: Tubular brass with 0.045" (17 ga.) Wall thickness, slip-joint inlet, cleanout, wall flange, escutcheons, and size to match equipment. Use chrome-plated tube for exposed applications.

3. Continuous Waste: Tubular brass, 0.045" (17 ga.) Wall thickness, with slip-joint inlet, and size to match equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for potable, hot- and cold-water supply piping systems; soil, waste, and vent piping systems; and supports. Verify that locations and sizes of piping and locations and types of supports match those indicated, before installing and connecting fixtures. Use manufacturer's roughing-in data when roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Include supports for plumbing fixtures according to the following:

1. Reinforcement: For floor-mounted lavatories and sinks that require securing to wall and recessed, box-mounted, electric water coolers.

2. Fabricate reinforcement from 2-by-4-inch or 2-by-6-inch metal stud blocking between studs or 1/4-by-6-inch steel plates attached to studs, in wall construction, to secure fixtures to wall. Include length that will extend beyond ends of fixture mounting bracket and attach to at least 2 studs.

B. Include fitting insulation kits for accessible fixtures according to the following:

1. Lavatories: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.

2. Sinks: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.

3. Fixtures with Offset Drain: Cover hot- and cold-water supplies, offset drain, trap, and waste to wall.

4. Other Fixtures: Cover exposed fittings below fixture.

3.3 PLUMBING FIXTURE INSTALLATION

A. Assemble plumbing fixtures and trim, fittings, faucets, and other components according to manufacturers' written instructions.

B. Install fixtures level and plumb according to manufacturers' written instructions, roughing-in drawings, and referenced standards.

C. Install floor-mounted, floor-outlet water closets with fittings and gasket seals.

D. Install toilet seats on water closets.

E. Install wall-hanging, back-outlet urinals with gasket seals.

F. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for handicapped people to reach.

G. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

H. Fasten floor-mounted fixtures to substrate. Fasten fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.

I. Fasten recessed, wall-mounted fittings to reinforcement built into walls.

J. Fasten wall-mounted fittings to reinforcement built into walls.

K. Fasten counter-mounting plumbing fixtures to casework.

L. Secure supplies to supports or substrate within pipe space behind fixture.

M. Set shower receptors and mop basins in leveling bed of cement grout.

N. Install individual stop valve in each water supply to fixture. Use gate or globe valve where specific stop valve is not specified.

O. Install water-supply stop valves in accessible locations.

P. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.

Q. Install shower, flow-control fittings with specified maximum flow rates in shower arms.

R. Install traps on fixture outlets. Omit traps on fixtures having integral traps. Omit traps on indirect wastes, except where otherwise indicated.

S. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.

T. Seal joints between fixtures and walls, floors, and counters using sanitary-type, 1-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other Division 22 Sections.

B. Supply and Waste Connections to Plumbing Fixtures: Refer to plumbing fixture schedules at the end of this Section for fitting sizes and connection requirements for each plumbing fixture.

C. Supply and Waste Connections to Equipment Specified in Other Sections: Connect equipment with supply inlets, supply stops, supply risers, and traps specified in this Section. Use fitting sizes required to match connected equipment. Connect fittings to plumbing piping.

D. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

E. Arrange for electric-power connections to fixtures and devices that require power. Electric power is specified in Division 26 Sections.

3.5 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized and demonstrate proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.6 ADJUSTING AND CLEANING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at drinking fountains, electric water coolers, faucets, shower valves, and flushometer valves having controls, to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

D. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Include the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.

2. Remove sediment and debris from drains.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities, except when approved in writing by Owner.

3.8 WATER CLOSET SCHEDULE - TANK TYPE

A. Water Closet: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on drawings:

1. Products: Subject to compliance with requirements, provide one of the following:

2. Vitreous-China Water Closet:

a. American Standard, Inc.
b. Kohler Co.
c. Zurn Plumbing Products

3. Toilet Seat:

a. Bemis Mfg. Co.
b. Centoco Manufacturing Corp.
c. Church Seat Co.
d. Olsonite Corp.
e. Sanderson Plumbing Products, Inc.; Beneke Industries, Ltd.
f. Sperzel.
g. Zurn Plumbing Products

4. Design Water Consumption: 1.6 gal. per flushing cycle.

5. Supply Inlet: 3/8-inch NPS with wall flange.

6. Supply Stop: Wheel handle.

7. Supply Riser: 3/8-inch NPS, rigid riser with collar end.

8. Toilet Seat: Solid-plastic, water-closet seat with bumpers and hardware, compatible with water closet and as follows:

    a. Class: Commercial, Heavy-Duty type, exceeding requirements of Commercial, Standard class.

3.9 URINAL SCHEDULE

A. Urinal: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:

1. Products: Subject to compliance with requirements, provide one of the following:
2. Vitreous-China Urinal:

    a. American Standard, Inc.
    b. Kohler Co.
    c. Sloan Valve Co.
    d. Zurn Plumbing Products

3. Flushometer Valve:

    a. American Standard.
    b. Sloan Valve Co.
    c. Zurn Industries, Inc

4. Flushometer Valve Construction: Cast-brass body, brass or copper pipe or tubing inlet with wall flange and tailpiece with spud, screwdriver check stop, and vacuum breaker.

5. Flushometer Valve Operation: Diaphragm.

6. Flushometer Valve Finish: Polished, chrome-plated, exposed metal parts.

7. Flushometer Valve, Water Consumption: Factory set 0.5 gal. maximum per flushing cycle.

8. Flushometer valve components include the following:

    a. Brass, lever-handle actuation.

    b. Non-hold-open feature.

3.10 LAVATORY SCHEDULE

A. Lavatory: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:

1. Products: Subject to compliance with requirements, provide one of the following:

2. Vitreous-China Lavatory:

   a. American Standard, Inc.
   b. Kohler Co.
   c. Sloan Valve Co.
   d. Zurn Industries.

3. Faucet:

   a. American Standard, Inc.
   b. Chicago Faucet Co.
   c. Delta Faucet
   d. Kohler Co.
   e. Speakman Co.
   f. Symmons Ind.
   g. T & S Brass and Bronze Works, Inc.
   h. Zurn Industries

4. Fitting Insulation Kit:

   a. TRUEBRO, Inc.
   b. McGuire
   c. Brocar

5. Supplies: See Fittings section of this specification.

6. Faucet Construction: Cast brass with ceramic cartridges and polished chrome finish.

7. Faucet Water Consumption: 1.5 or 0.5 gpm as specified on drawings.

8. Supply Insulation Kit: Molded, soft-plastic covering for supplies from wall to fixture with removable covering for stops and handles. Include manufacturer's standard fasteners, straps, and adhesives.

9. Drain Insulation Kit: Molded, soft-plastic covering for drain piping from fixture to wall. Include manufacturer's standard fasteners, straps, and adhesives.

10. Fixture Support: Type II, concealed arm; vertically adjustable, lavatory, chair carrier with heavy-duty, rectangular-steel, upright members; and feet.

3.11 SHOWER SCHEDULE

A. Shower: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:

1. Products: Subject to compliance with requirements, provide one of the following:
2. Shower Base:

   a. American Standard, Inc.
   b. Aqua Bath Co., Inc.
   c. Aqua Glass Corp.
   d. Clarion Fiberglass Manufacturing, Inc.
   e. Crane Plumbing.
   f. Fiat Products, Inc.
   g. Freedom Showers
   h. Kohler Co.

i. Lasco

3. Anti-scald Faucet:

a. Lawler Manufacturing Co., Inc.
b. Leonard Valve Co.
c. Mark Controls Corp.; Powers Process Controls.
d. Symmons Industries, Inc.
e. Zurn Industries

4. Mixing-Valve Faucet and Miscellaneous Fittings:

a. Lawler Manufacturing Co., Inc
b. Leonard Valve Co.
c. Mark Controls Corp.; Powers Process Controls.
d. Symmons Industries, Inc.
e. Zurn Industries

5. Shower Base: Acrylic plastic with slip-resistant bathing surface. Provide ¾" barrier free thresholds on ADA units.

6. Shower Base Dimensions: See drawings.

7. Shower Base: Integral corrosion-resistant metal with removable strainer and 2-inch NPS bottom outlet.

8. Faucet Construction: Cast-brass, pressure-equalizing-control with high-temperature-limit control, single-handle mixing valve with check stops, and escutcheon.

9. Faucet Components: Include the following:

a. Handle{s}: Single-lever, chrome-plated brass.

b. Shower Head, Arm, and Flange: Manufacturer's standard with manual flow control in head.

c. Shower Arm, Flow-Control Fitting: 2-1/2 gpm.

d. Hand Shower, Hose, and Brackets or Slide: Manufacturer's standard.

e. Hose-Supply, Flow-Control Fitting: 2-1/2 gpm.

10. Supplies: Copper tubing with ball, gate, or globe valve if check stops not included with faucet.

11. Drain: Included with enclosure. 2-inch NPS, nickel-bronze-strainer, floor drain.

12. Trap: 2-inch NPS drainage piping.

3.12 SINK SCHEDULE

A. Accessible: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the Drawings:

1. Products: Subject to compliance with requirements, provide one of the following:

2. Stainless-Steel Sink:

   a. Elkay Manufacturing Co.
   b. Just Manufacturing Co.
   c. Franke Kindred

3. Faucet:

   a. American Standard, Inc.
   b. Chicago Faucet Co.
   c. Delta Faucet
   d. Kohler Co.
   e. Speakman Co.
   f. Symmons Ind.
   g. T&S Brass and Bronze Works, Inc.
   h. Zurn Industries

4. Disposer:

   a. In-Sink-Erator Div.

5. Fitting Insulation Kit:

   a. TRUEBRO, Inc.
   b. McGuire
   c. Brocar

6. Fixture Stainless-Steel Thickness: 18 gauge.

7. Fixture Mounting: Counter, self-rimming.

8. Faucet Construction: See Fixture Schedule for faucet styles.

9. Faucet Water Consumption: 2.0 gpm maximum flow.

10. Drain{s}: 1-1/2-inch removable, stainless-steel strainer bucket with 3-1/2-inch removable, stainless-steel crumb cup with 1-1/2-inch NPS tubular-brass tailpiece.

11. Food-Waste Disposer: Household, continuous feed. Include 115 VAC, 1725-rpm motor with overload protection and reset button; wall switch; corrosion-resistant chamber with jam-resistant grinder or shredder; 1-1/2-inch NPS outlet; quick-mounting, stainless-steel sink flange; anti-splash guard; and combination cover/stopper.

    a. Model: 1/2-hp, model with cutlery- or stainless-steel grinder or shredder. shredder and sound-insulated chamber. shredder, sound-insulated chamber, and stainless-steel outer shell.

12. Supplies: See Fittings section of this specification.

3.13 MOP-SERVICE BASIN SCHEDULE

A. Mop-Service Basin: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:

1. Products: Subject to compliance with requirements, provide one of the following:

2. Terrazzo Mop-Service Basin:

    a. Fiat Products, Inc.
    b. Forestone
    c. Stern-Williams Co., Inc.

3. Faucet:

    a. American Standard, Inc.
    b. Chicago Faucet Co.
    c. Delta Faucet
    d. Kohler Co.
    e. Speakman Co.
    f. T & S Brass and Bronze Works, Inc.
    g. Zurn Industries

4. Fixture Dimensions: See Plumbing Fixture Schedule on drawings.

5. Mounting: Floor.

6. Rim Guard: Manufacturer's standard.

7. Faucet: Widespread, cast brass with supplies on 8-inch centers.

8. Faucet Mounting: Wall, centered on fixture.

9. Faucet Components: Include the following:

    a. Finish: Rough chrome.

    b. Handles: Dual lever or 4 arm.

    c. Supply Stops: Integral, in shanks.

    d. Spout: With integral vacuum breaker, pail hook, and hose-thread outlet.

    e. Wall Brace: Assembly with wall bracket and support to faucet spout.

    f. Hose: 30-inch-minimum, flexible hose with stainless-steel hose wall bracket.

10. Drain: 3-inch NPS with grid strainer.

11. P-Trap: 3-inch NPS drainage piping.

12. Supplies: 1/2-inch NPS copper tubing with supply stop.

13. Reinforcement: Provide for wall-mounting faucet, wall brace, and hose-hook bracket.

3.14 ELECTRIC WATER COOLER SCHEDULE

A. Electric Water Cooler: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Acorn Aqua; Acorn Mfg. Co.
b. Elkay Manufacturing Co.
c. Halsey Taylor.
d. Haws Drinking Faucet Co.
e. Oasis

2. Fixture Type: Bubbler.

3. No. of Bubblers or Stations: One.

4. Fixture Cabinet Material: Stainless steel.

5. Fixture Mounting: Wall.

6. Wall Grille: Stainless steel.

7. Supply: 3/8-inch NPS copper tubing with supply stop.

8. Include manufacturer’s standard water bottle filling station with sensor operation.

END OF SECTION 224000

SECTION 224050
ELEVATOR SUMP PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of pumps for permanent installation in plumbing systems:

1. Sump pumps.

2. Oil detection systems and controls.

1.3 DEFINITIONS

A. Permanent-Installation Pumps: Type suitable for fixed installation and connection to piping systems.

B. Submersible Pumps: Type that operates with motor submerged in water.

C. Sump Pumps: Type suitable for lifting waste-water not containing solids from a sump or wet location to a point of discharge. Pumps normally have strainer on inlet. This type includes wet-pit-mounted, vertical sump pumps and submersible sump pumps.

D. Oil Detection System: Detection system with oil sensing probes which detect presence of oil and hydraulic fluid. Positive detection of oil by probes will activate alarm and shutdown sump pump.

1.4 PUMP PERFORMANCE REQUIREMENTS

A. Pump Pressure Ratings: At least equal to maximum pump-operating pressure.

1.5 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and other Division Specification Sections.

B. Product data including certified performance curves, weights (shipping, installed, and operating), furnished specialties, alarms, probes and accessories. Include startup instructions.

C. Shop drawings showing layout and connections for pumps and detection systems. Include setting drawings with templates, directions for installation of foundation and anchor bolts, and other anchorages.

D. Wiring diagrams detailing wiring for power, signal, and control systems differentiating between manufacturer-installed wiring and field-installed wiring.

E. Maintenance data for each type and size pump specified to include in the "Operating and Maintenance Manual."

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with provisions of the following:

1. ASME B31.9 "Building Services Piping" for piping materials and installation.

2. H.I. "Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps" for pump design, manufacture, and installation.

3. UL 778 "Standard for Motor Operated Water Pumps" for construction requirements. Include UL listing and labeling.

4. NEMA MG 1 "Standard for Motors and Generators" for electric motors. Include NEMA listing and labeling.

5. NFPA 70 "National Electrical Code" for electrical components and installation.

B. Single-Source Responsibility: Obtain same type of pumps from a single manufacturer with pumps, components, and accessories from a single source. Include responsibility and accountability to answer and resolve problems regarding compatibility, installation, performance, and acceptance of pumps.

C. Design Criteria: Drawings indicate sizes, profiles, connections, and dimensional requirements of pumps and are based on specific manufacturer types and models indicated. Pumps having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles do not change the design concept or intended performance as judged by the Design Professional. The burden of proof for equality of pumps is on the proposer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store pumps in a clean, dry location.

B. Retain shipping flange protective covers and protective coatings during storage.

C. Protect bearings and couplings against damage from sand, grit, or other foreign matter.

D. Comply with pump manufacturer's rigging instructions for handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Submersible Sump Pumps:

a. Aurora Pumps, General Signal.
b. Federal Pump Corp.
c. Flygt Corp. Subsid., ITT Fluid Technology Corp.
d. Goulds Pumps, Inc.
e. Grundfos Pumps Corp.
f. Liberty Pumps.
g. Little Giant Pump Co. Subsid., Tecumseh Products Co.

h. F.E. Myers, Pentair Co.
i. Paco Pumps, Inc.
j. Stancor, Inc.
k. Sta-Rite Industries, Inc.
l. Weil Pump Co.
m. Zoeller Co.

2.2 PUMPS, GENERAL

A. Plumbing Pumps: Factory assembled and tested, and of construction required for permanent installation.

B. Motors: NEMA MG 1; single speed with type of enclosure and electrical characteristics indicated. Include built-in thermal-overload protection and grease-lubricated ball bearings. Motors are non-overloading within full range of pump performance curves.

C. Finish: Manufacturer's standard paint applied to factory-assembled and -tested plumbing pump unit prior to shipping.

D. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

2.3 SUMP PUMPS

A. General Description: Centrifugal, end-suction, single-stage sump pump, with inlet strainer, motor, and operating controls.

B. Impeller: Cast iron or cast bronze, statically and dynamically balanced, open or semi-open, overhung, single suction, keyed to shaft, and secured by locking cap-screw.

C. Submersible, Waste-Water Sump Pumps: Simplex, submersible, direct-connected type, with basin cover with holes with gaskets in cover as required.

1. Casing: Cast iron with integral, cast-iron inlet strainer and stainless steel hardware. Include discharge companion flange arranged for vertical discharge and suitable for plain-end pipe connection.

2. Pump and Motor Shaft: Stainless steel, with factory-sealed, grease-lubricated ball bearings.

3. Seal: Mechanical seal.

4. Motor: Hermetically sealed capacitor-start type, with built-in overload protection. Include a 3-conductor waterproof power cable of length required, but not less than 10 feet, with a grounding plug and cable-sealing assembly for connection at pump.

5. Motor Housing: Stainless steel with stainless steel hardware.

6. Pump Discharge Piping: Factory or field fabricated, ASTM A 53, Schedule 40, galvanized-steel pipe, bronze pipe, or copper tube, except where specific material is indicated.

2.4 GENERAL-DUTY VALVES

A. Refer to other Division 22 sections for general-duty gate, ball, butterfly, globe, and check valves.

2.5 PUMP CONTROLS

A. Float Switch Controls: 120 volts a.c., NEMA 250, Type 6 micro-pressure or mercury float switches, mounted on discharge piping.

B. Oil Sensing Controls: Control unit shall consist of oil detection probes and a float switch. Operation of pump shall be based on the following:

1. Position of float switch will determine if pump is operating.

2. If oil sensor probe detects presence of oil, then controller will suspend operation of pump to prevent the pumping of oil.

3. High water alarm will be activated by a separate probe or float switch.

2.6 OIL-SENSING PUMP CONTROL PANEL

A. Control panel shall be UL Listed and include pump system controls, power cord and alarms. Audible and visual high-water alarms shall be included. Control panel shall include a contact for connection to a remote alarm. Include cables connections to oil-sensing probes. Include field adjustable switch for oil-sensitivity.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment foundations, and conditions with Installer present for compliance with requirements for installation and other conditions affecting performance of pumps. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine roughing-in of plumbing piping systems to verify actual locations of piping connections prior to pump installation.

3.2 INSTALLATION

A. General: Comply with pump manufacturer's written installation instructions.

B. Install pumps in locations indicated and arrange to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.

C. Support piping so that weight of piping is not supported by pumps.

D. Submersible Sump Pumps: Install submersible sump pumps, set on basin, pit, or sump floor. Make direct connections to storm drainage piping.

E. Mount pump control panel in an accessible location.

3.3 CONNECTIONS

A. General: Connect piping to pumps as indicated. Install valves that are same size as piping connecting to pumps.

B. Install discharge pipe sizes equal to or greater than diameter of pump nozzles.

C. Install check valve and gate or ball valve on each sump pump discharge.

D. Install electrical connections for power, controls, and devices.

E. Electrical power and control wiring and connections are specified in Division 26 Sections.

3.4 ADJUSTING

A. Pump Controls: Set pump controls for automatic start, stop, and alarm operation as required for system application.

3.5 COMMISSIONING

A. Final Checks Before Startup: Perform the following preventive maintenance operations and checks before startup:

1. Lubricate oil-lubricated-type bearings.

2. Remove grease-lubricated bearing covers and flush bearings with kerosene and thoroughly clean. Fill with new lubricant according to manufacturer's recommendations.

3. Disconnect couplings and check motors for proper rotation. Rotation shall match direction of rotation marked on pump casing.

4. Check that pumps are free to rotate by hand. Do not operate pump, if bound or even drags slightly, until cause of trouble is determined and corrected.

5. Check that pump controls are correct for required application.

B. Starting procedure for pumps with shutoff power not exceeding safe motor power:

1. Start motors.

2. Open discharge valves slowly.

3. Observe leakage from stuffing boxes and adjust sealing liquid valves for proper flow to ensure lubrication of packing. Let packing "run in" before reducing leakage through stuffing boxes; then tighten glands.

4. Check general mechanical operation of pumps and motors.

END OF SECTION 224050

SECTION 230000
GENERAL HVAC PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes general provisions covering the contract documents for HVAC Systems.

1.3 DEFINITIONS

A. Provide shall mean "Furnish, install and connect."

B. Piping shall mean "pipe installed with all specified fittings, valves and accessories, and forming a complete system."

C. HVAC shall mean "Heating, Ventilation and Air Conditioning."

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Electrical Coordination: In addition to submittal requirements of other Division 23 Sections, submit a document approved by the project Electrical Contractor certifying that all mechanical equipment being furnished under Division 23 complies with the electrical characteristics of the source power which will be furnished under Division 26.

C. Extra Materials: Where specification sections call for extra materials (i.e., filters, etc.) submit a complete list of all such materials including total quantities and sizes for review. Delivered quantities will be verified at the completion of the project.

1. Upon delivery of the extra materials to the Owner, an Owner’s representative shall sign the materials list certifying receipt.

2. The signed receipt shall be included in the closeout documents.

D. Model numbers listed on the Mechanical Contract Documents shall not be construed to indicate electrical characteristics. Electrical characteristics of mechanical equipment shall be as indicated on the Electrical Contract Documents (Division 26).

E. Review of Submittals does not relieve the Contractor of any of the requirements of the Contract Documents. Failure by the Engineer to document errors and omissions in the Contractor's submittals during the Engineer's submittal review does not constitute a waiver of any of the requirements of the original sealed Contract Documents.

1.5 CONTRACTOR QUALIFICATIONS

A. HVAC Subcontractor shall have a current Class II (Non-restricted) Conditioned Air Contractors License for the state in which the project is being constructed. The Subcontractor shall have as part of the Firm a Service Department qualified to service all systems installed in the project or have a written agreement with a Service Agency qualified to provide such service. The Service Department or Agency shall be on call at all hours. The subcontractor shall have installed at least (within the last five years):

1. Three (3) hydronic water systems of at least 150-tons in size.

2. One heat recovery variable refrigerant flow system of at least 20-tons in size.

3. Three Dx system buildings of at least 100-tons total capacity with more than one system in excess of 5-tons.

1.6 PRIOR APPROVALS

A. Manufacturers References: When reference is made in the Contract Documents to trade names or specific manufacturers and/or models, such reference, unless noted otherwise, is made to designate and identify the quality of materials or equipment to be furnished and is not intended to restrict competitive bidding. If it is desired to use materials or equipment different from those indicated on the Contract Documents, written request for approval must reach the hands of the primary Design Professional at least TEN DAYS prior to the date set for the opening of bids. A copy of the request should also be sent directly to the Engineer. Requests for prior approval of a proposed substitute shall be accompanied by complete technical data supporting the request.

1.7 LAYOUT AND COORDINATION

A. Layout Basis:

1. The equipment listed on the drawing schedules or in the technical specifications as “basis of design” or “owner preferred” has been used for the physical arrangement of the mechanical systems. When equipment listed as acceptable, equal or equipment which has received "prior approval" is used, it shall be the Contractor's responsibility to provide structural, ductwork, electrical, service clearances, or other changes required to accommodate the substituted equipment. Changes shall be made at no additional cost to the Owner. Submit a list of required changes along with all prior approval requests and shop drawing submittals.

2. The Contract Drawings are intended to show the general arrangement of all mechanical work. They do not show in detail all offsets, fittings and transitions. Examine Drawings, investigate site conditions to be encountered and arrange work accordingly. Furnish all offsets and transitions required.

3. Drawings do not indicate in detail exact configuration of connections for fixtures, equipment and accessories. Final connection shall be as shown on approved Manufacturer's Submittal Drawings. Where Manufacturer's Submittal Drawings conflict with the Contract Documents, confer with the Design Professional for resolution.

4. Measurement of Drawings by scale shall not be used as dimensions for fabrication. Measurements for locating fixtures, equipment, ductwork, piping and other mechanical items shall be made on the site and shall be based on actual job conditions.

5. Check space limitations and verify electrical requirements before ordering any mechanical equipment or materials. Place large equipment inside the building prior to the erection of exterior walls where equipment cannot enter finished building openings.

B. Coordination: Mechanical work shall be coordinated with that of other trades to avoid conflict. The Contractor shall study all plans and specifications for this project and shall notify the Design Professional of any conflict between work under Division 23 and work under other divisions of the Project. Particular attention shall be given to interference between piping, electrical installations, structural systems, building openings and ductwork.

C. Installation Instructions: Manufacturer's installation instructions for all equipment furnished under Division 23 shall be furnished by the Contractor. Instructions shall be maintained on the jobsite until the project is complete, and then turned over to the Owner.

D. Operation and Maintenance Instructions: Electronic copies of equipment O&M manuals shall be submitted to the Owner a minimum of 15 days prior to equipment/systems training. An index document indicating project name, project number, building name and contents shall be included. Model and serial numbers of equipment shall be shown on the cover of their respective O&M manual(s). Warranty registration documentation shall be included where applicable, including documentation confirming warranties have been registered with the equipment manufacturer.

1.8 PERMITS

A. Obtain all necessary Permits and Inspections required for the installation of this work and pay all charges incident thereto. Deliver to the Design Professional all certificates of inspection issued by authorities having jurisdiction.

B. Sewer tap fees, water tap fees, meter fees, Dept. of Labor Fees for Boilers and Pressure Vessels and all other charges for work under Division 23, including charges for meter installation and excess service by the Gas Company or any other utilities shall be paid by the Contractor.

1.9 SAFETY

A. OSHA Requirements applicable to the project shall be complied with at all times.

B. Manufacturer's Safety Instructions shall be followed in all instances.

C. Asbestos Containing Materials (ACM) shall not be used on this project.

D. Refrigerants containing CFC’s or HCFS’s shall not be used on this project, nor shall any equipment using such refrigerants be incorporated into this project.

E. Electrical Equipment Clearances: Piping, equipment and other mechanical installations shall not be located within 42" of the front or 36" of the side of any electrical switchboards, panelboards, power panels, motor control centers, electrical transformers or similar electrical equipment. Piping and ductwork shall not pass through or above electrical equipment rooms except as required to serve those rooms.

F. Guards shall be provided where appliances, equipment, fans or other components that require service are located within 10 feet of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches above the floor, roof or grade below. The guard shall extend not less than 30 inches beyond each end of such appliances, equipment, fans, components and roof hatch openings and the top of the guard shall be located not less than 42 inches above the elevated surface adjacent to the guard. The guard shall be constructed so as to prevent the passage of a 21-inch diameter sphere and shall comply with the loading requirements for guards specified in the International Building Code.

1.10 PROTECTION OF MECHANICAL SYSTEMS AND COMPONENTS DURING CONSTRUCTION

A. Material storage:

1. All materials and equipment stored on the jobsite shall be elevated above the ground and stored under suitable weather cover. Materials and equipment shall not be situated in areas subjected to localized flooding.

2. Manufacturer's original shipping packaging and protective coverings shall be left in place until the equipment is prepared for installation.

B. Roof protection: All penetrations through roofs, including roof curbs, piping curbs and roof drainage system elements shall be properly protected during construction to prevent water intrusion into the building. Protective measures could include temporary covers and plugs, as well as other appropriate temporary elements.

C. Electrical enclosure protection:

1. During construction, all protective covers and other devices shall be left in place that protect against inadvertent contact with live electrical circuits.

2. All warning labels related to electrical and rotating equipment hazards shall be in place prior to energizing mechanical equipment circuits.

D. Protection of ducts and piping:

1. Maintain temporary closures on the ends of all ducts and pipes as the installation work progresses. Temporary closures include plastic sheeting, tape and appropriate caps and covers.

2. Where debris enters piping during installation, steps shall be taken to clean the interior of the pipe prior to placing in service.

3. Where debris enters ductwork during installation the duct interior shall be cleaned prior to placing in service.

E. Operation of HVAC systems during construction:

1. Although the operation of the permanent HVAC systems during the construction process is strongly discouraged, the Contractor shall take measures to protect the systems from contamination if they are operated.

2. When placed in operation during the construction period, all HVAC systems shall have MERV 8 filtration in all standard filter racks throughout the systems. Where so equipped, final filter banks do not have to be in place.

3. All return and outdoor air intake openings shall be protected with MERV 8 filter material at all points of entry into the duct system. These protections shall be maintained and remain in place until the building is prepared for final inspection.

4. Prior to final acceptance of the building HVAC systems, the interior of all HVAC unit cabinets shall be thoroughly cleaned to “like-new” condition.

1.11 CODES AND STANDARDS

A. Mechanical installations shall conform to the current edition (recognized by the State) of the following, in addition to any previously mentioned Codes and Standards.

1. The International Building Code.
2. The International Mechanical Code.
3. The International Plumbing Code.
4. The International Fire Protection Code.
5. The State Energy Code.
6. NFPA Standard 70, National Electric Code.
7. NFPA Standard 90A, Installation of Air Conditioning and Ventilation Systems.
8. NFPA Standard 101, Code for Safety to Life for Fire in Buildings and Structures.
9. The FGI Guidelines for Design and Construction of Hospital and Healthcare Facilities.

1.12 ASBESTOS MATERIALS

A. Contractor is advised there may be **ASBESTOS PRODUCTS** in building(s) which will affect work under this Project. Particular reference is made to piping, equipment and other items that may be modified or removed. It shall be the sole responsibility of Contractor to check for and ascertain presence of asbestos materials where such presence affects work under this Project. Where Contractor ascertains presence of asbestos materials, he shall notify Owner and Engineer in writing of presence of asbestos **BEFORE** beginning any work. Removal of asbestos products shall be the responsibility of Owner **AFTER** he has been notified by Contractor of its presence.

B. Engineer assumes no responsibility of investigating for presence of **ASBESTOS PRODUCTS** or for verifying presence of asbestos materials, nor does Engineer assume any responsibility for specifying, advising on, or supervising removal of any asbestos products. Contractor and Owner shall hold harmless Engineer in any matters involving presence of, or removal of, asbestos products.

1.13 INTERRUPTION OF EXISTING SERVICES

A. Exercise care so as not to cut any existing utilities or services. Where an existing utility line or service line is cut it shall be repaired to "like-new" condition. Interruption of service shall not be made without prior written permission of the Owner.

B. Plumbing, Electrical and HVAC system must remain in service during construction. Arrange with the Owner well in advance of shutdowns required for tie-ins. Shutdowns shall be made after normal occupancy hours if so directed by the Owner. No additional monies will be paid for after-hours shutdowns.

C. Upper floors will remain occupied for the duration of construction. Shutdowns of exhaust risers shall be limited and shall be coordinated with the Owner.

PART 2 - PRODUCTS Not required for this section.

PART 3 - EXECUTION Not required for this section.

END OF SECTION 230000

SECTION 230500
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement other Division 23 Sections.

1. Piping materials and installation instructions common to most piping systems.

2. Concrete equipment base construction requirements.

3. Equipment nameplate data requirements.

4. Labeling and identifying mechanical systems and equipment is specified in Division 23.

5. Non-shrink grout for equipment installations.

6. Field-fabricated metal and wood equipment supports.

7. Installation requirements common to equipment specification Sections.

8. Mechanical demolition.

9. Cutting and patching.

10. Touchup painting and finishing.

B. Pipe and pipe fitting materials are specified in piping system Sections.

1.3 DEFINITIONS

A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.

B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

F. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Shop drawings detailing fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

C. Coordination drawings for access panel and door locations.

D. Prepare coordination drawings of Mechanical Rooms, Yards and Roof to a 1/4 inch equals 1 foot scale or larger. Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Show where sequence and coordination of installations are important to the efficient flow of the Work. Include the following:

1. Proposed locations of piping, ductwork, equipment, and materials. Include the following:

a. Planned piping layout, including valve and specialty locations and valve stem movement.

b. Planned duct systems layout, including elbow radii and duct accessories.

c. Clearances for installing and maintaining insulation.

d. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.

e. Equipment service connections and support details.

f. Exterior wall and foundation penetrations.

g. Fire-rated wall and floor penetrations.

h. Sizes and location of required concrete pads and bases.

2. Scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

3. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

4. Reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.

E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

A. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code--Steel."

B. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.

C. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

D. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

E. Coordinate all electrical service requirements for mechanical equipment prior to the submittal of shop drawings. Confirm the compatibility of all power services with the equipment being furnished. Confirm compatibility of electrical lugs being provided by the equipment manufacturer with the power wiring being furnished under Division 26. Furnish written documentation that all characteristics have been coordinated with and confirmed by the electrical subcontractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Protect stored plastic pipes from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

E. Coordinate connection of electrical services.

F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces.

H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual piping system specification Sections in Division 23 for special joining materials not listed below.

B. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch minimum thickness, except where thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125 cast-iron and cast-bronze flanges.

    b. Narrow-Face Type: For raised-face, Class 250 cast-iron and steel flanges.

2. ASME B16.20 for grooved, ring-joint, steel flanges.

3. AWWA C110, rubber, flat face, 1/8-inch thick, except where other thickness is indicated; and full-face or ring type, except where type is indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, except where other material is indicated.

D. Plastic Pipe Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, except where other type or material is indicated.

E. Solder Filler Metal: ASTM B 32.

1. Alloy Sn95 or Alloy Sn94: Tin (approximately 95 percent) and silver (approximately 5 percent), having 0.10 percent lead content.

F. Brazing Filler Metals: AWS A5.8.

1. BCuP Series: Copper-phosphorus alloys.

2. BAg1: Silver alloy.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements: Manufacturer's standard solvents complying with the following:

1. Acrylonitrile-Butadiene-Styrene (ABS): ASTM D 2235.

2. Chlorinated Poly (Vinyl Chloride) (CPVC): ASTM F 493.

3. Poly (Vinyl Chloride) (PVC): ASTM D 2564.

4. PVC to ABS Transition: Made to requirements of ASTM D 3138, color other than orange.

I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.

J. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon steel bolts and nuts.

K. Couplings: Iron body sleeve assembly, fabricated to match outside diameters of plain-end pressure pipes.

1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47, Grade 32510 or ASTM A 536 ductile iron.

3. Gaskets: Rubber.

4. Bolts and Nuts: AWWA C111.

5. Finish: Enamel paint.

2.3 PIPING SPECIALTIES

A. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.

1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.

2. Insulating Material: Suitable for system fluid, pressure, and temperature.

3. Dielectric Unions: Factory-fabricated, union assembly for 250-psig minimum working pressure at a 180 deg F temperature.

4. Dielectric Flanges: Factory-fabricated, companion-flange assembly for 150- or 300-psig minimum pressure to suit system pressures.

5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

   a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.

6. Dielectric Couplings: Galvanized-steel coupling, having inert and noncorrosive, thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F temperature.

7. Brass Fittings: It is acceptable to use brass fittings in lieu of dielectric fittings to transition from ferrous to non-ferrous piping.

B. Mechanical Sleeve Seals: Modular, watertight mechanical type. Components include interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve. Connecting bolts and pressure plates cause rubber sealing elements to expand when tightened.

C. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet-Metal: 24-gage or heavier galvanized sheet metal, round tube closed with welded longitudinal joint.

2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.

3. Cast-Iron: Cast or fabricated wall pipe equivalent to ductile-iron pressure pipe, having plain ends and integral water stop, except where other features are specified.

4. Cast-Iron Sleeve Fittings: Commercially made sleeve having an integral clamping flange, with clamping ring, bolts, and nuts for membrane flashing.

D. Piping Roof Curbs:

1. Curb and cap shall be constructed of minimum 18-guage galvanized sheet metal with continuous welded seams.

2. Provide cant-strip at the base of curb for flashing.

3. Line curb with 1½-inch fiberglass insulation.

4. Galvanized sheet metal cap shall have welded sheet metal collars (sleeves) for each pipe that allow for installation of insulated pipe.

5. Seal annular space between pipe/insulation and collar with a flexible weatherproof boot and stainless-steel pipe clamps.

6. Cap shall be secured to the curb nailer with cadmium plated screws; minimum one per side.

2.4 IDENTIFYING DEVICES AND LABELS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23 Sections. Where more than one type is specified for listed application, selection is Installer's option, but provide single selection for each product category.

B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped, permanently fastened to equipment.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.

2. Location: An accessible and visible location.

C. Snap-On Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid snap-on, color-coded pipe markers, conforming to ASME A13.1.

D. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, conforming to ASME A13.1.

E. Valve Tags: Engraved brass numbered tags on steel chain.

F. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white (letter color) melamine sub-core, except when other colors are indicated.

1. Fabricate in sizes required for message.

2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.

3. Punch for mechanical fastening.

4. Thickness: 1/16 inch, except as otherwise indicated.

5. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.

G. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.

1. Multiple Systems: Where multiple systems of same generic name are indicated, provide identification that indicates individual system number as well as service such as "Boiler No. 3," "Air Supply No. 1H," or "Standpipe F12."

2.5 GROUT

A. Non-shrink, Nonmetallic Grout: ASTM C 1107, Grade B.

1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.

3. Packaging: Premixed and factory-packaged.

2.6 FIRE-STOPPING

A. Fire-Resistant Sealant: Provide UL Listed firestopping system for filling openings around penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

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

1. Specified Technologies, Inc.
2. 3M Corporation
3. Metacaulk.
4. Hilti, Inc.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS--COMMON REQUIREMENTS

A. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 23 specify piping installation requirements unique to the piping system.

B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

C. Install piping at indicated slope.

D. Install components having pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's printed instructions.

M. Install sleeves for pipes passing through concrete and masonry walls, concrete floor and roof slabs, exterior walls and where indicated.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring where specified.

2. Build sleeves into new walls and slabs as work progresses.

3. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than 6 inches.

b. Steel Sheet-Metal Sleeves: For pipes 6 inches and larger that penetrate gypsum-board partitions.

c. Cast-Iron Sleeve Fittings: For floors having membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Flashing is specified in other division sections.

1) Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.

4. Except for below-grade wall penetrations, seal annular space between sleeve and pipe or pipe insulation in non-rated floors and partitions, using elastomeric joint sealants. EXCEPTION: Fire rated partition penetrations shall be sealed with U.L. Listed firestopping systems.

N. Above Grade, Exterior Wall, Pipe Penetrations: Seal penetrations using sleeves and elastomeric sealant. Size sleeve for ½-inch annular clear space between pipe and sleeve for installation of sealant.

1. Install steel pipe for sleeves smaller than 6 inches.

2. Install sheet metal sleeve assembly for sleeves 6 inches and larger.

3. Install cast iron sleeves according to manufacturer’s preprinted instructions.

O. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with U.L. Listed firestopping sealant system.

P. Verify final equipment locations for roughing in.

Q. Refer to equipment specifications in other Sections for roughing-in requirements.

R. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system Sections.

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

3. Soldered Joints: Construct joints according to AWS "Soldering Manual," Chapter 22 "The Soldering of Pipe and Tube."

4. Brazed Joints: Construct joints according to AWS "Brazing Manual" in the "Pipe and Tube" chapter.

5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter. Join pipe fittings and valves as follows:

   a. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.

   b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).

   c. Align threads at point of assembly.

   d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.

   e. Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

6. Welded Joints: Construct joints according to AWS D10.12 "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe" using qualified processes and welding operators according to the "Quality Assurance" Article.

7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

8. Plastic Pipe and Fitting Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following standards:

   a. Comply with ASTM F 402 for safe handling of solvent-cement and primers.

b. Acrylonitrile-Butadiene-Styrene (ABS): ASTM D 2235 and ASTM D 2661.

c. Chlorinated Poly (Vinyl Chloride) (CPVC): ASTM D 2846 and ASTM F 493.

d. Poly (Vinyl Chloride) (PVC) Pressure Application: ASTM D 2672.

e. Poly (Vinyl Chloride) (PVC) Non-Pressure Application: ASTM D 2855.

f. PVC to ABS (Non-Pressure) Transition: Procedure and solvent cement described in ASTM D 3138.

9. Plastic Pipe and Fitting Heat-Fusion Joints: Prepare pipe and fittings and join with heat-fusion equipment according to manufacturer's printed instructions.

a. Plain-End Pipe and Fittings: Butt joining.

b. Plain-End Pipe and Socket-Type Fittings: Socket joining.

S. Piping Connections: Except as otherwise indicated, make piping connections as specified below.

1. Install unions in piping 2 inches and smaller adjacent to each valve and at final connection to each piece of equipment having a 2-inch or smaller threaded pipe connection.

2. Install flanges in piping 2-1/2 inches and larger adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.

3. Install dielectric unions and flanges or brass fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION--COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Design Professional.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.

D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

E. Install equipment giving right-of-way to piping systems installed at a required slope.

F. Equipment and appliances containing evaporators or cooling coils shall be installed with a means of condensate removal in compliance with IMC 307.2. A water level detection device conforming to UL 508 shall be provided for all main condensate pans and be interlocked to de-energize the unit's main fan should the drain pan water level exceed the main drain pipe connection level. Additional measures shall be taken where indicated on drawings or specifications.

3.3 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: Complying with ASME A13.1.

2. Plastic markers, with application systems. Install on pipe insulation segment where required for hot non-insulated pipes.

3. Locate pipe markers wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums), and exposed exterior locations as follows:

a. Near each valve and control device.

b. Near each branch, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.

c. Near locations where pipes pass through walls, floors, ceilings, or enter inaccessible enclosures.

d. At access doors, manholes, and similar access points that permit view of concealed piping.

e. Near major equipment items and other points of origination and termination.

f. Spaced at a maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.

4. On piping above removable acoustical ceilings, provide as noted in the previous paragraph, except omit intermediately spaced markers.

B. Valves: Provide tags on all valves provided under the project. Furnish a typed list of all tags to the Owner at project closeout.

C. Equipment: Install engraved plastic laminate sign or equipment marker on or near each major item of mechanical equipment.

1. Lettering Size: Minimum 1/4-inch -high lettering for name of unit where viewing distance is less than 2 feet, 1/2-inch -high for distances up to 6 feet, and proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.

2. Text of Signs: Provide text to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to name of identified unit.

D. Mark all above ceiling devices such as valves, fire dampers, pumps and HVAC equipment with signs located on the ceiling below.

E. Adjusting: Relocate identifying devices which become visually blocked by work of this Division or other Divisions.

3.4 PAINTING AND FINISHING

A. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

B. Paint all exposed steel surfaces of piping and supports with one coat of primer and two coats of enamel.

3.5 CONCRETE BASES

A. Construct concrete equipment bases of dimensions indicated, but not less than 4 inches larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive strength concrete with 6 x 6 x #10 reinforcing wire mesh. Outdoor concrete bases shall extend a minimum of 4" above grade and be a minimum thickness of 6".

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1 "Structural Welding Code--Steel."

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.8 DEMOLITION

A. Disconnect, demolish, and remove work specified under Division 23 and as indicated.

B. Where pipe, ductwork, insulation, or equipment remaining is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

C. Accessible Work: Remove indicated pipe and ductwork in its entirety. Cap existing piping and ductwork that remains in place.

D. Abandoned Work: Cut and remove pipe abandoned in place, 2 inches beyond the face of adjacent construction. Cap piping and patch surface to match existing finish.

E. Removal: Remove indicated equipment, piping and ductwork from the Project site unless noted otherwise.

F. Where equipment is indicated to be demolished and removed, and utility runouts are not designated for re-use:

1. Remove associated gas hydronic, steam and refrigerant runout piping from the equipment back to the branching point or source unit. Cap remaining pipe and reinsulate as required.

2. Remove associated power wiring and raceway back to circuit protection device. Re-label circuit protection device.

3. Remove associated control devices, and control wiring.

G. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

H. Where floor-mounted equipment is removed, concrete pads shall be removed unless designated for re-use.

I. Remove all hangers, supports and anchors associated with mechanical items being removed. Patch surfaces to match adjacent finishes.

3.9 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of the trades involved.

B. Repair cut surfaces to match adjacent surfaces.

3.10 GROUTING

A. Install nonmetallic non-shrink grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms for placement of grout, as required.

D. Avoid air entrapment when placing grout.

E. Place grout to completely fill equipment bases.

F. Place grout on concrete bases to provide a smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's printed instructions.

END OF SECTION 230500

SECTION 230529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes hangers and supports for mechanical systems piping and equipment.

1.3 DEFINITIONS

A. Terminology used in this Section is defined in MSS SP-90.

1.4 PERFORMANCE REQUIREMENTS

A. Design seismic restraint hangers and supports, for piping and equipment.

B. Design and obtain approval from authority with jurisdiction over seismic restraint hangers and supports for piping and equipment.

1.5 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data for each type of hanger and support.

C. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

E. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.

1.6 QUALITY ASSURANCE

A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code--Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

C. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.

1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.

D. Licensed Operators: Use operators that are licensed by powder-operated tool manufacturers to operate their tools and fasteners.

E. Licensed Engineer: Prepare hanger and support design drawings, and calculations for seismic restraint of piping and equipment. Include seal and signature of Registered Engineer, licensed in jurisdiction where Project is located, certifying compliance with specifications.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.

1. Components include galvanized coatings or alternate rust preventing shop coating.

2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

B. Thermal-Hanger Shield Inserts: 100-psi average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.

C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

2.2 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36, steel plates, shapes, and bars, black and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.

C. Washers: ASTM F 844, steel, plain, flat washers.

D. Grout: ASTM C 1107, Grade B, non-shrink, nonmetallic.

1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is non-staining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.

3. Water: Potable.

4. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in the Section specifying the equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 HANGER AND SUPPORT INSTALLATION

A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.

C. Install supports with maximum spacings complying with MSS SP-69.

D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.

F. Install concrete inserts in new construction prior to placing concrete.

G. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

H. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

K. Support all piping direct from structure and independent of other piping.

L. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

M. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.

O. Insulated Piping: Comply with the following installation requirements.

1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.

2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.

3. Shields: Install MSS Type 40, protective shields on insulated piping. Shields span an arc of 180 degrees and have dimensions in inches not less than the following:

NPS (Inches)	LENGTH (Inches)	THICKNESS (Inches)
1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
8 to 14	24	0.075
16 to 24	24	0.105

4. Pipes 6 Inches and Larger: Include shield inserts.

5. Insert Material: Length at least as long as the protective shield.

6. Thermal-Hanger Shields: Install with insulation of same thickness as piping.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.

B. Grouting: Place grout under supports for equipment and make a smooth bearing surface.

3.4 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.

B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without under-cut or overlap.

3. Remove welding flux immediately.

4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

C. Paint all exposed steel surfaces with one coat of primer and two coats of enamel.

END OF SECTION 230529

SECTION 230547
SEISMIC BRACING FOR SUSPENDED UTILITIES AND FLOOR MOUNTED EQUIPMENT

PART 1 – GENERAL

1.1 SUMMARY

A. This section covers seismic restraints for utilities and equipment including HVAC Ductwork, HVAC Piping and HVAC Equipment. Equipment seismic shall be in accordance with IBC 2018 and calculations for anchorage shall be provided per the code.

1.2 SEISMIC BRACING

A. Seismic bracing shall comply with the following standards.

1. Seismic design criteria as indicated on the Structural Drawings.

2. 2018 International Building Code Chapter 16 Earthquake Loads.

3. ASCE 7-10

4. 2018 International Building Code Chapter 17 Structural Tests and Special Inspections.

1.3 SUBMITTALS

A. Submittals to include appropriate details and reflect actual jobsite conditions. Submittal to be wet stamped by a registered structural engineer specialized in the design of seismic restraints and licensed in the state where the project is located.

B. Jobsite conditions not covered by the manufacturer's design manual shall be engineered on an individual basis and all calculations and details shall be wet stamped by a registered structural engineer specialized in the design of seismic restraints and licensed in the state where the project is located.

C. Submit seismic bracing layouts for all suspended utilities on shop drawings wet stamped by a registered Structural Engineer specialized in the design of seismic restraints and licensed in the state where the project is located. The basis for the layouts shall be the utility contractors shop drawings, and the addition of the bracing locations shall be the responsibility of this section.

D. Layout drawings to include:

1. All vertical support and seismic bracing locations.

2. All vertical support and seismic bracing connections to the structure (Anchorage Manufacturer, Quantity and Size for each location.)

3. Vertical Support and brace arm reactions at all connection points to the structure (for the Structural Engineer of Record use in checking suitability of the building structure.

4. Type and size of brace member.

5. Reference installation detail #'s for vertical support and seismic bracing.

6. Maximum Transverse Lateral and Longitudinal brace spacing for each utility.

7. Seismic accelerations each utility has been designed to resist.

8. Suspended utility max weight per lineal foot (lbs/1f) or max pipe/conduit size at all seismic locations.

9. Minimum all threaded rod size at all seismic locations.

1.4 SPECIFICATION QUALITY ASSURANCE

A. Where the Component Importance Factor (Ip) is greater than 1.0 for any mechanical, electrical, component or system, that system is considered to be a "Designated Seismic System" per Chapter 17 of the 2012 IBC. Each Contractor responsible for the construction of a Designated Seismic System shall submit a written "statement of responsibility", per the 2012 IBC, to the building official and owner prior to the commencement of work on the system or component.

B. Upon completion of construction a Quality Assurance Representative of the seismic force resisting system manufacturer / designer shall review the installation of the seismic-force-resisting system and provide documentation indicating conformance to shop drawing seismic restraint layout and with the manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. ISAT (International Seismic Application Technology)
2. Unistrut
3. Gripple
4. Tolco
5. Loos

B. Material Requirements:

1. All manufacturer specific components that are part of the seismic- resistance system must be strength tested by third party vendors with test reports available upon request.

2. All anchors utilized as part of the component anchorage and /or seismic anchorage must comply with ASCE 7-10. Specifically all anchors must be tested for seismic applications in conformance with ACI 355.2.

2.2 SPECIFICATION DEVIATIONS

A. Any contractor or manufacturer wishing to deviate for the project code requirements must submit in writing the following:

1. Deviation requested

2. Reason for the deviation to include code or local jurisdiction allowances

3. Cost impact for deviation

B. A manufacturer's letter of exception will not be considered acceptable justification for deviations. Deviations citing differences between SMACNA and IBC/ASCE exclusions as reasoning for deviation will not be considered.

2.3 PROJECT SPECIFIC CHARACTERISTICS

A. Building Seismic Design Category: As indicated on the structural and architectural drawings.

B. Building Occupancy Category: As indicated on the structural and architectural drawings.

C. All non-structural mechanical components on this project have an importance factor of 1.0 or (1.5) (per mechanical engineer).

PART 3 – EXECUTION

3.1 INSTALLATION OF SEISMIC BRACING

A. Installation of seismic bracing systems shall be in accordance with manufacturer's instructions and requirements as well as the governing codes cited above.

END OF SECTION 230547

SECTION 230548
VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes vibration isolators, vibration isolation bases and vibration isolation roof curbs.

1.3 SUBMITTALS

A. Product Data: Indicate types, styles, materials, and finishes for each type of isolator specified. Include load deflection curves.

1.4 QUALITY ASSURANCE

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

B. All isolation deflections shall be based on ASHRAE 2007 Handbook - HVAC Applications, Chapter 47. The isolation of any mechanical equipment included in these plans that is not specifically covered by these specifications shall be isolated in accordance with Chapter 47, Table 48 as described above.

1.5 COORDINATION

A. Coordinate layout and installation of vibration isolation devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate size and location of concrete housekeeping and vibration isolation bases. Cast anchor-bolt inserts into base.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Kinetics Noise Control, Inc. (basis of design)
2. Amber/Booth Company, Inc.
3. Vibration Mountings and Controls
4. Mason Industries
5. Vibration Eliminator

2.2 ISOLATOR TYPES

A. Type 4, Floor-Mounted Equipment (non seismic):

1. Vibration isolators shall be free standing, un-housed, laterally stable springs wound from high strength spring steel. Springs shall have a lateral stiffness greater than 0.8 times the rated vertical stiffness and shall be designed to provide up to 50% overload capacity. Springs shall be selected to provide operating static deflections shown on the Vibration Isolation Schedule or as indicated on the project documents. Springs shall be color coded or otherwise identified to indicate load capacity. In capacities up to 5,000 lbs., springs shall be replaceable. In capacities over 5,000 lbs., springs shall be welded to the top and bottom load plate assemblies. Springs shall be assembled between a top and bottom steel load plate. The upper load plate shall be provided with steel leveling bolt lock nut and washer for attachment to the supported equipment. The lower load plate shall have a non-skid noise isolation pad bonded to the bottom and have provisions for bolting the isolator to the supporting structure.

2. Isolators shall be equal to Kinetics Model FDS

B. Type 10, Suspended Equipment, Piping, Ductwork:

1. Vibration Isolators shall consist of a steel spring and neoprene element in series mounted in a stamped or welded steel bracket for insertion into the hanger rod assembly.

2. The elastomer insert shall be neoprene, molded from oil resistant compounds and shall be color coded to indicate load capacity and selected to operate within its published load range.

3. The steel spring shall consist of large diameter laterally stable steel springs assembled into formed or welded steel housing assemblies designed to limit Springs shall have a lateral stiffness greater than 0.8 times the rated vertical stiffness and shall be designed to provide up to 50% overload capacity.

2.3 BASES, RAILS AND CURBS

A. Type D, Roof Mounted Vibration Isolation Curbs:

1. All roof top air conditioning units shall be mounted and installed on vibration isolation curbs. The vibration isolation curbs shall be a complete assembly designed to resiliently support the equipment with a minimum operating height of 21” and shall be fully enclosed and weather tight.

2. The isolation curb shall consist of an upper support rail with supply and return air duct supports and a lower support curb that is attached to the supporting roof structure. The upper and lower supports shall be separated by free- standing un-housed, laterally stable spring isolators. Access ports shall be provided in the curb to access spring isolators.

3. The upper support rail shall be fabricated from a structural channel with sufficient elevation above the springs to preclude interference with the rooftop equipment and permit access to inspect the spring isolators.

4. The lower support curb shall be a formed galvanized steel channel with a 1 2" wood nailer around the perimeter of the supporting upper rail. The lower support curb shall be a minimum of 14" high.

5. An ozone and UV resistant weather seal shall be installed between the upper and lower supports to provide a weatherproof installation.

6. Spring isolators shall be selected to provide 1" deflection for the equipment installed. Steel springs shall be free standing, un-housed, laterally stable. Springs shall have a minimum lateral stiffness of 1.2 times the rated vertical stiffness and shall be designed for a 50% overload to solid height.

7. Curb shall be insulated with a minimum of 1" fiberglass insulation.

8. Curb shall be engineered and certified to meet the seismic requirements of the location installed. A licensed registered engineer shall stamp curb design and engineering calculations to show compliance to the International Building Code.

9. Curbs shall be equal to Kinetics Model ESR.

B. Type E, Roof Curbs:

1. Roof curbs for roof mounted equipment shall be a minimum of 1/2" wide and 14" high and be fabricated from G 90 galvanized steel fully welded at each corner. Curbs shall be fabricated from a minimum of 18-gage steel or heavier as required to support the intended equipment.

2. Curbs shall have fully mitered corners and base plates to secure curb to the support roof steel.

3. Curbs shall be reinforced with internal steel angles to provide a rigid support for the equipment.

4. Curbs shall be insulated with a minimum of 1-1/2" thick 3# density, fiberglass insulation.

5. Curbs shall have a 2"x2" wood nailer attached to the curb top for securing the equipment.

6. Curbs shall be seismically rated for the installation in accordance with the International Building Code. A registered engineer shall stamp submittals.

7. Curbs shall be equal to Curbs Plus Model CPC-3.

2.4 SOUND CONTROL PRODUCTS

A. Acoustical Sound Barrier:

1. Acoustical sound barrier material shall be installed within the curb area of all roof top units.

2. Barrier material shall be constructed of a vinyl material with a reinforced fiberglass screen loaded with barium sulfate, 1.0 lb per square foot. Tensile strength shall be 300 lbs per inch and tear strength shall be 100 lbs per in.

3. Install 2 layers of acoustical barrier material inside the roof curb. Barrier material shall be cut and uniformed installed inside the curb area on top of the metal roof deck and around the supply and return air ducts.
4. Barrier material shall be equal to Kinetics KNM-100 RB.

B. Acoustical Duct Wrap Barrier:

1. Acoustic duct wrap barrier shall be fabricated of a composite material consisting of an acoustic barrier material bonded to a thin layer of aluminum foil on one side and a decoupling layer of fiberglass batting material.

2. Acoustic barrier shall be constructed of 0.10" thick barium sulphate loaded limp vinyl.

3. Barrier material shall have a "K" value of 0.29 and STC rating of 28.

4. Barrier material shall have a nominal density of 1 psf.

5. Barrier material shall be equal to Kinetics Model 100 ALQ-1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. If the equipment provided is not furnished with integral structural steel supports, mounting feet or lifting lugs, the contractor shall provide miscellaneous steel shapes as required to install or suspend the equipment and attach the vibration isolation devices as specified herein.

B. Support steel shall include but not be limited to rails, brackets, angles, channels, and similar components.

C. All equipment specified to be isolated shall be installed and isolators shall be attached to the building structure or floor and the vibration isolators shall be adjusted and leveled so that the vibration isolators are performing properly.

D. All vibration isolation products, flexible pipe connectors and sound control products shall be installed as outlined in the manufacturer's printed installation instructions.

E. Fill concrete inertia bases, after installing base frame, with 3000-psig concrete, and trowel to a smooth, hard finish.

F. Install pipe isolation connectors at connections for equipment supported on vibration isolators. Install isolation hangers on the first three piping supports adjacent to vibration producing equipment (i.e. air handling units, pumps, etc.).

3.2 VIBRATION ISOLATION CERTIFICATE OF COMPLIANCE

A. The manufacturer's representative shall be responsible for providing such assistance and supervision as necessary to assure a correct installation and adjustment of vibration isolation products.

B. The manufacturer's representative shall visit the installation once all installed items have been completed but prior to the installation of ceilings or walls that may conceal any devices and inspect the installation for compliance with the manufacturer's installation instructions.

Upon satisfaction that all devices are installed correctly, and systems are isolated properly, the representative shall submit a written report outlining the installation as in compliance with these specifications and the manufacturer's installation instructions.

3.3 VIBRATION ISOLATION SCHEDULE FOR MECHANICAL SYSTEMS

Equipment Type	Isolator	Base	Deflection
Suspended Air Handling Units	Type 10	None	1.0"
Piping located in Mechanical Rms.	Type 10	None	1.0"
Roof Mounted DOAS Units	Type 4	Type D	1.0"

END OF SECTION 230548

SECTION 230593
TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:

1. Balancing airflow and water flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.

2. Adjusting total HVAC systems to provide indicated quantities.

3. Measuring electrical performance of HVAC equipment.

4. Setting quantitative performance of HVAC equipment.

5. Verifying that automatic control devices are functioning properly.

6. Measuring sound and vibration.

7. Reporting results of the activities and procedures specified in this Section.

B. Related Sections include the following:

1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.

2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.

L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

M. AABC: Associated Air Balance Council.

N. AMCA: Air Movement and Control Association.

O. CTI: Cooling Tower Institute.

P. NEBB: National Environmental Balancing Bureau.

Q. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.4 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.

B. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3 of this Section.

C. Strategies and Procedures Plan: Within 60 days from the Contractor's Notice to Proceed, submit 2 copies of the testing, adjusting, and balancing strategies and step-by-step procedures as specified in Part 3 "Preparation" Article below. Include a complete set of report forms intended for use on this Project.

D. Certified Testing, Adjusting, and Balancing Reports: Submit reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

E. Sample Report Forms: Submit 3 sets of sample testing, adjusting, and balancing report forms.

F. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

1.5 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.

B. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Design Professional's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

a. Submittal distribution requirements.

b. Contract Documents examination report.

c. Testing, adjusting, and balancing plan.

d. Work schedule and Project site access requirements.

e. Coordination and cooperation of trades and subcontractors.

f. Coordination of documentation and communication flow.

C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.

2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

3. Certify that the Agent has either tested and balanced systems according to the Contract Documents or that systems are balanced to optimum performance capabilities within design and installation limits.

D. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

E. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards or in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

F. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

G. Test and balance process is not deemed as accepted until a complete report is received free of deficiencies and discrepancies and approved in writing by the Engineer.

1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.7 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.8 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Furnish one of the following special warranties:

1. National Project Performance Guarantee: Provide a guarantee on AABC'S "National Standards" forms stating that AABC will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents.

2. Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.

2. Verify that balancing devices are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine project record documents.

D. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

F. Examine system and equipment test reports.

G. Examine HVAC system and equipment installations to verify that indicated balancing devices are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

H. Review manufacturer’s certification for each piece of HVAC equipment to be tested. Test and balance shall not be performed until certification letters have been obtained.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

L. Examine equipment for installation and for properly operating safety interlocks and controls.

M. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices operate by the intended controller.

2. Dampers and valves are in the position indicated by the controller.

3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.

4. Thermostats and sensors are located to avoid adverse effects of sunlight, drafts, and cold walls.

5. Sensors are located to sense only the intended conditions.

6. Sequence of operation for control modes is according to the Contract Documents.

7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.

8. Interlocked systems are operating.

9. Changeover from heating to cooling mode occurs according to design values.

N. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.

2. Hydronic systems are filled, clean, and free of air.

3. Automatic temperature-control systems are operational.

4. Equipment and duct access doors are securely closed.

5. Balance, smoke, and fire dampers are open.

6. Isolating and balancing valves are open and control valves are operational.

7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

8. Windows and doors can be closed so design conditions for system operations can be met.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" or AABC National Standards and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

3.5 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES

A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems. Additional procedures are required for variable-air-volume, multizone, dual-duct, induction-unit supply-air systems and process exhaust-air systems. These additional procedures are specified in other articles in this Section.

B. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.

b. Measure static pressure directly at the fan outlet or through the flexible connection.

c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.

d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each air-handling unit component.

a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as duct silencers under final balanced conditions.

4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.

5. Adjust fan speed higher or lower than design with the approval of the Design Professional. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

a. Where sufficient space in submains and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design airflows within specified tolerances.

D. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using standard measurement practices.

E. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.

1. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

F. Measure outdoor air flow minimum requirement damper settings as scheduled with controls contractor. Document voltage settings of control damper actuator in the minimum cfm position. For units with CO_2 controls, measure outdoor air flow maximum requirement settings as scheduled with controls contractor. Document voltage setting of control damper actuator in the maximum cfm position. Controls contractor shall provide on-site technical support to modulate outside air damper min/max position with test and balance contractor to accomplish min/max cfm settings for proper unit operation.

3.6 BI-POLAR IONIZATION UNITS

A. Confirm operation of bi-polar ionization units, where installed, using a voltage detector or other means to determine the presence of ions in the airstream. Report any nonconforming units.

3.7 MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.

2. Motor horsepower rating.

3. Motor rpm.

4. Efficiency rating if high-efficiency motor.

5. Nameplate and measured voltage, each phase.

6. Nameplate and measured amperage, each phase.

7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Speed Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.8 CONDENSING UNITS

A. Verify proper rotation of fans and measure entering- and leaving-air temperatures. Record compressor data.

3.9 HEAT-TRANSFER COILS

A. Dx Coils: Measure the following data for each coil:

1. Dry-bulb temperatures of entering and leaving air.

2. Wet-bulb temperatures of entering and leaving air (for cooling coils).

3. Airflow.

4. Air pressure drop.

B. Electric-Heating Coils: Measure the following data for each coil:

1. Nameplate data.

2. Airflow.

3. Entering- and leaving-air temperatures at full load.

4. Voltage and amperage input of each phase at full load and at each incremental stage.

5. Calculated kW at full load.

6. Fuse or circuit-breaker rating for overload protection.

3.10 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of 2 successive 8-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

3.11 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as damper and valve operators.

F. Verify sequence of operation of control devices.

G. Confirm interaction of electrically operated switch transducers.

H. Confirm interaction of interlock and lockout systems.

I. Record voltages of power supply and controller output. Determine if the system operates on a grounded or non-grounded power supply.

J. Note operation of electric actuators using spring return for proper fail-safe operations.

3.12 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans: Plus 5 to plus 10 percent.

2. Air Outlets and Inlets: Minus 10 percent to plus 10 percent.

a. In spaces that are to have positive pressure relationship to adjacent spaces, the overall space tolerances for supply airflow shall be 0 to plus 10 percent and return/exhaust airflow shall be 0 to minus 10 percent.

b. In spaces that are to have a negative pressure relationship to adjacent spaces, the overall space tolerances for supply airflow shall be 0 to minus 10 percent and return/exhaust airflow shall be 0 to plus 10 percent.

3.13 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.14 FINAL REPORT

A. General: Electronic (PDF) format, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of document signed and sealed by the certified testing and balancing engineer.

1. Include a list of the instruments used for procedures, along with proof of calibration.

2. Include letters from HVAC equipment manufacturers certifying that each piece of equipment has been installed and commissioned in accordance with manufacturer’s recommendations.

C. Final Report Contents: In addition to the certified field report data, include the following:

1. Pump curves.

2. Fan curves.

3. Manufacturers' test data.

4. Field test reports prepared by system and equipment installers.

5. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

3.15 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: Perform testing, adjusting, and balancing procedures during near-peak summer (above 85ºF) and during near-peak winter conditions (below 40ºF.) Retainage may be held until each season has been tested. Refer to contract documents.

END OF SECTION 230593

SECTION 230700
HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

A. This Section includes pipe, duct, and equipment insulation.

1.3 DEFINITIONS

A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.

B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.

C. Cold Surfaces: Normal operating temperatures less than 75 deg F.

D. Thermal resistivity is designated by an R-value that represents the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivity (R-value) is expressed by the temperature difference in degrees Fahrenheit between the two exposed faces required to cause 1 BTU per hour to flow through 1 square foot at mean temperatures indicated

E. Thermal Conductivity (k-value): Measure of heat flow through a material at a given temperature difference; conductivity is expressed in units of Btu x inch/h x sq. ft. x deg F.

F. Density: Is expressed in lb./cu.ft.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract.

B. Product data for each type of mechanical insulation identifying k-value, thickness, and accessories. Provide a summary in schedule form of intended insulation material, jacket type, thickness and adhesive type for each pipe, duct or equipment using manufacturer’s nomenclature.

1.5 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

1.6 SEQUENCING AND SCHEDULING

A. Schedule insulation application after testing of piping and duct systems.

B. Schedule insulation application after installation and testing of heat trace tape.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Glass Fiber:

a. CertainTeed Corporation
b. Knauf Fiberglass GmbH
c. Manville
d. Owens-Corning Fiberglas Corporation
e. USG Interiors, Inc. - Thermafiber Division

2. Flexible Elastomeric Cellular:

a. Armaflex; Armacell LLC
b. K-Flex; Nomaco K-Flex Corporation
c. Aerocel; Aeroflex USA, Inc.

2.2 GLASS FIBER

A. Material: Inorganic glass fibers, bonded with a thermosetting resin.

B. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.

C. Board: ASTM C 612, Class 2, semi-rigid jacketed board.

1. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F average maximum, at 75 deg F mean temperature.
2. Density: 3 pcf minimum.

D. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets.

1. Thermal Conductivity: 0.32 Btu x inch/h x sq. ft. x deg F average maximum, at 75 deg F mean temperature.
2. Density: 3/4 pcf minimum within building envelope.
3. Density: 1 pcf minimum exterior to building envelope.

E. Adhesive: Produced under the UL Classification and Follow-up service.

1. Type: Non-flammable - solvent-based.
2. Service Temperature Range: Minus 20 to 180 deg F.

F. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.3 FLEXIBLE ELASTOMERIC CELLULAR

A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.

1. Tubular Materials: ASTM C 534, Type I.
2. Sheet Materials: ASTM C 534, Type II.

B. Thermal Conductivity: 0.25 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F.

C. Coating: Water based latex enamel coating recommended by insulation manufacturer.

D. Fire Performance Characteristics: Provide material having the following fire performance characteristics as determined by UL in accordance with ASTM Standard E84:

Flame Spread = 25
Smoke Developed = 50

2.4 INSULATING CEMENTS

A. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C 449.

B. Thermal Conductivity: 1.2 Btu x inch/h x sq. ft. x deg F average maximum at 400 deg F mean temperature.

C. Compressive Strength: 100 psi at 5 percent deformation.

2.5 ADHESIVES

A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:

1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.

2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.6 JACKETS

A. General: ASTM C 921, Type 1, except as otherwise indicated.

B. Foil and Paper Jacket: Laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

1. Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E 96.

2. Puncture Resistance: 50 beach units minimum, when tested according to ASTM D 781.

C. PVC Jacketing: High-impact, ultra-violet-resistant PVC, 20 mils thick, roll stock ready for shop or field cutting and forming to indicated sizes.

1. Adhesive: As recommended by insulation manufacturer.

D. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20 mil thick, high-impact, ultra-violet-resistant PVC.

1. Adhesive: As recommended by insulation manufacturer.

E. Aluminum Jacket: ASTM B 209, 3003 Alloy, H-14 temper, roll stock ready for shop or field cutting and forming to indicated sizes.

1. Finish and Thickness: Stucco embossed finish, 0.016 inch thick.

2. Moisture Barrier: 1 mil, heat-bonded polyethylene and kraft paper.

3. Elbows: Preformed 45-degree and 90-degree, short- and long-radius elbows, same material, finish, and thickness as jacket.

2.7 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, pre-sized a minimum of 8 ounces per sq. yd.

1. Tape Width: 3 inches.

2. Cloth Standard: MIL-C-20079H, Type I.

3. Tape Standard: MIL-C-20079H, Type II.

B. Bands: ¾-inch wide, in one of the following materials compatible with jacket:

1. Stainless Steel: Type 304, 0.020 inch thick.

2. Galvanized Steel: 0.005 inch thick.
3. Aluminum: 0.007 inch thick.

4. Brass: 0.01 inch thick.

5. Nickel-Copper Alloy: 0.005 inch thick.

C. Wire: 14 gage nickel copper alloy, 16 gage, soft-annealed stainless steel, or 16 gage, soft-annealed galvanized steel.

D. Corner Angles: 28-gage, 1-inch by 1-inch aluminum, adhered to 2-inches by 2-inches kraft paper.

E. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.8 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition.

1. Water Vapor Permeance: 0.08 perm maximum.

2. Temperature Range: Minus 20 to 180 deg F.

B. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.

1. Water Vapor Permeance: 0.02 perm maximum.

2. Temperature Range: Minus 50 to 250 deg F.

3. Color: Aluminum.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

B. Mix insulating cements with clean potable water. Mix insulating cements contacting stainless-steel surfaces with demineralized water.

1. Follow cement manufacturer's printed instructions for mixing and portions.

3.2 INSTALLATION, GENERAL

A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.

B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

C. Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60 deg F.

D. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

E. Install insulation with smooth, straight, and even surfaces.

F. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.

G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.

H. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45-degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.

I. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.

J. Keep insulation materials dry during application and finishing.

K. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:

1. Fibrous glass ducts.

2. Factory-insulated flexible ducts.

3. Factory-insulated plenums, casings, terminal boxes and filter boxes and sections.

4. Flexible connectors for ducts and pipes.

5. Vibration control devices.

6. Testing laboratory labels and stamps.

7. Nameplates and data plates.

8. Pre-insulated access panels and doors in air distribution systems.

9. Sanitary drainage and vent piping. (Drainage piping receiving air conditioning condensate shall be insulated.)

3.3 PIPE INSULATION INSTALLATION, GENERAL

A. Tightly butt longitudinal seams and end joints. Bond with adhesive.

B. Stagger joints on double layers of insulation.

C. Apply insulation continuously over fittings, valves, and specialties, except as otherwise indicated.

D. Apply insulation with a minimum number of joints.

E. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.

2. Cover circumferential joints with butt strips, at least 3 inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.

3. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.

a. Exception: Do not staple longitudinal laps on insulation applied to piping systems with surface temperatures at or below 35 deg F.

4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.

5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.

6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

F. Roof Penetrations: Apply insulation for interior applications to a point even with the top of the roof flashing. Seal with vapor barrier coating. Apply insulation for exterior applications butted tightly to interior insulation ends. Extend metal jacket for exterior insulation outside roof flashing at least 2 inches below top of roof flashing. Seal metal jacket to roof flashing with vapor barrier coating.

G. Wall and Partition Penetration: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

H. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with a U.L. Listed firestopping or fire-resistant joint sealer.

I. Floor Penetrations: Terminate insulation underside of floor assembly and at floor support at top of floor.

J. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply pre-molded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.

1. Use same material and thickness as adjacent pipe insulation.

2. Overlap nesting insulation by 2 inches or 1-pipe diameter, whichever is greater.

3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.

4. Insulate elbows and tees smaller than 3 inches pipe size with pre-molded insulation.

5. Insulate elbows and tees 3 inches and larger with pre-molded insulation or insulation material segments. Use at least 3 segments for each elbow.

6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.

K. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified in Division 23 Section "Hangers and Supports."

3.4 FLEXIBLE ELASTOMERIC CELLULAR PIPE INSULATION INSTALLATION

A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.

B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.

1. Miter cut materials to cover soldered elbows and tees.

2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.5 DUCT INSULATION

A. Install block and board insulation as follows:

1. Adhesive and Band Attachment: Secure block and board insulation tight and smooth with at least 50 percent coverage of adhesive. Install bands spaced 12 inches apart. Protect insulation under bands and at exterior corners with metal corner angles. Fill joints, seams, and chipped edges with vapor barrier compound.

2. Speed Washers Attachment: Secure insulation tight and smooth with speed washers and welded pins. Space anchor pins 18 inches apart each way and 3 inches from insulation joints. Apply vapor barrier coating compound to insulation in contact, open joints, breaks, punctures, and voids in insulation.

B. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:

1. Smaller Than 24 Inches: Bonding adhesive applied in 6 inches wide transverse strips on 12 inches centers.

2. 24 Inches and Larger: Anchor pins spaced 12 inches apart each way. Apply bonding adhesive to prevent sagging of the insulation.

3. Overlap joints 3 inches.

4. Seal joints, breaks, and punctures with vapor barrier compound and glass tape (glasfab and mastic).

3.6 JACKETS

A. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2 inches laps at longitudinal joints and 3-inch-wide butt strips at end joints.

1. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound (mastic) and glass tape (glassfab).

B. Interior Exposed Insulation: Install continuous aluminum jackets.

C. Exterior Exposed Insulation: Install continuous aluminum jackets and seal all joints and seams with waterproof sealant.

D. Install metal jacket with 2 inches overlap at longitudinal and butt joints. Overlap longitudinal joints to shed water. Seal butt joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel draw bands 12 inches on center and at butt joints.

E. Install the PVC jacket with 1-inch overlap at longitudinal and butt joints and seal with adhesive.

F. Install glass cloth jacket directly over insulation. On insulation with a factory applied jacket, install the glass cloth jacket over the factory applied jacket. Install jacket drawn smooth and tight with a 2-inch overlap at joints. Embed glass cloth between (2) 1/16inch thick coats of lagging adhesive. Completely encapsulate the insulation with the jacket, leaving no exposed raw insulation.

3.7 FINISHES

A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed exterior insulation.

3.8 APPLICATIONS

A. General: Materials and thicknesses are specified in schedules at the end of this Section.

B. Piping Systems: Unless otherwise indicated, insulate the following piping systems:

1. Air conditioning condensate drains and sanitary P-traps receiving air conditioning condensate.

2. Refrigerant suction and hot gas piping.

3. All refrigerant piping used for split systems with inverter-driven outdoor units (i.e. mini-splits, ductless split systems.)

4. All refrigerant piping used for variable refrigerant volume systems.

C. Duct Systems: Unless otherwise indicated, insulate the following duct systems:

1. Supply, return and outside air ductwork.

2. Above-ceiling surfaces of all air devices except where pre-insulated.

3. Interior exposed supply, return and outside air ductwork.

4. Exterior exposed supply and return ductwork.

5. Interior exposed and concealed supply fans, air handling unit casings and outside air plenums.

3.9 PIPE INSULATION SCHEDULES

A. General: Furnish insulation vapor barrier on all piping carrying fluids below 60ºF.

B. Schedules:

1. All refrigerant piping used for split systems with inverter driven outdoor units (i.e. mini-splits, ductless split systems): 3/4” flexible elastomeric insulation. Paint exterior insulation with two coats of manufacturer’s recommended coating.

2. All refrigerant piping used for variable refrigerant volume systems: 3/4” flexible elastomeric insulation. Paint exterior insulation with two coats of manufacturer’s recommended coating.

3. Air Conditioning Condensate Drain and Humidifier Drain Piping: 3/8" flexible elastomeric insulation (interior applications only).

3.10 DUCTWORK AND PLENUM INSULATION SCHEDULES

A. General: Furnish vapor barrier on all ductwork insulation.

B. Schedules:

1. Supply, return, and outdoor air ductwork:

a. Lined and unlined within building insulation envelope: 2" glass fiber blanket. Seal all joints and penetrations in jacket with glasfab and mastic.

b. Outside Building Insulation Envelope: 3” glass fiber blanket or board.

2. Exterior Supply and return, relief ductwork between air inlet devices and energy recovery units, and outdoor air ductwork (lined and unlined): 3" glass fiber board with aluminum jacket.

3. Supply, Return and Outdoor Air Ductwork (lined and unlined) Exposed in Mechanical Rooms: 2" glass fiber board.

3.11 INSULATION EXPOSED IN MECHANICAL ROOMS

A. Finish all piping, equipment and ductwork insulation exposed in each mechanical room with a field applied 8 ounce per square yard canvas jacket cemented in place with white lagging adhesive.

B. Apply PVC pipe fitting covers over canvas.

C. Paint canvas with two coats of enamel paint. Colors shall be approved by the Design Professional. Piping insulation shall be painted in accordance with the Owner’s color scheme.

END OF SECTION 230700

SECTION 230900
CONTROLS SYSTEM EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components.

B. Related Section: Division 23 Section "Sequence of Operation" contains requirements that relate to this Section.

1.3 SYSTEM DESCRIPTION

A. Control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and direct digital controllers (DDC) operating in a high-speed, peer-to-peer network hosted by a Facility Management System (FMS) server running a webserver software application. System shall be programmed to operate mechanical systems according to sequences of operation indicated or specified.

B. System software shall be based on a server/thin-client architecture, designed around the open standards of web technology. The FMS system server shall be accessed using Web browsers over the control system network, the Owner's local area network (LAN), and over the Internet (at the Owner’s discretion). Current web browsers shall be capable of accessing the web server including, Google Chrome, Mozilla Firefox, Apple Safari and Microsoft Edge. Contractor shall be responsible for coordination with the Owner’s IT staff to ensure that the FMS will perform in the Owner’s environment without disruption to any of the other activities taking place on the LAN.

C. The intent of the thin-client architecture is to provide operators complete access to the control system via a Web browser. No additional software or applications shall be required to access graphic and point displays or configure trends, points and controllers. Computer and Mobile Device browsers shall be supported.

D. FMS contractor shall provide all control panels, power supplies, wiring, conduit, solenoid valves, relays, differential pressure transmitters, differential pressure switches, pressure sensors, interface devices, etc. necessary for a complete and operable automatic control system and for communication through the Owner’s LAN.

E. System shall use the BACnet protocol for communication to the FMS web server and for communication between control modules. I/O points, schedules, setpoints, trends, and alarms specified or on the drawings or identified in the "Sequence of Operation" shall be BACnet objects.

F. The FMS software graphic interface shall include a link to the VRF system controls web interface.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data for each type of product specified. Include manufacturer's technical Product Data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, installation instructions, and startup instructions.

C. Where equipment, controllers or sensors furnished as a part of other mechanical equipment are to be interlocked or interfaced with the control system (FMS) furnished under this section, provide documentation from the equipment manufacturer or supplier indicating all wiring and software requirements have been coordinated and accommodated. Provide references in the FMS diagrams and operational sequences indicating these accommodations. Where equipment controllers are integrated into the FMS via BACnet Protocol, provide the Protocol Implementation Conformance Statement (PICS) for each controller type and indicate which points being incorporated into the FMS are readable or writable, inputs or outputs, and analog or digital.

D. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Submit damper leakage and flow characteristics, plus size schedule for controlled dampers.

E. Shop Drawings containing the following information for each control system:

1. Schematic flow diagram showing fans, pumps, coils, dampers, valves.

2. Each control device labeled with setting or adjustable range of control.

3. Diagrams for all required electrical wiring. Clearly differentiate between factory-installed and field-installed wiring.

4. Details of control panel faces, including controls, instruments, and labeling.

5. Written description of sequence of operation.

6. Trunk cable schematic showing programmable control unit locations and trunk data conductors.

7. Listing of connected data points, including connected control unit and input device.

8. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.

9. System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

10. Software description and sequence of operation.

F. Wiring diagrams detailing wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed and field-installed wiring. Furnish wiring diagrams and coordination documentation for all controlled equipment furnished by other suppliers under Division 23.

G. Maintenance data for control systems equipment to include in the operation and maintenance manual. Include the following:

1. Maintenance instructions and spare parts lists for each type of control device.

2. Interconnection wiring diagrams with identified and numbered system components and devices.

3. Keyboard illustrations and step-by-step procedures indexed for each operator function.

4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

5. Calibration records and list of set points.

6. Manufacturer's literature for flow measurement systems.

H. Field Test Reports: Procedure and certification of pneumatic control piping system.

I. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer specializing in control system installations.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing control systems similar to those indicated for this Project and that have a record of successful in-service performance.

C. Startup Personnel Qualifications: Engage specially trained personnel in direct employ of manufacturer of primary temperature control system.

D. Comply with NFPA 90A.

E. Comply with NFPA 70.

F. Coordinate equipment selection with Division 26 Section covering Fire Alarm Systems to achieve compatibility with equipment that interfaces with that system.

G. For web-based control systems, furnish additional password and access license (if required) to the Engineer for a period not less than 1-year from control system start-up.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store equipment and materials inside and protected from weather.

B. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping control devices to unit manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Direct Digital Control (DDC) Systems and Components:

    a. Automated Logic Corp. (ALC)
    b. Carrier; i-Vu® System
    c. Johnson Controls, Inc.; Controls Group.
    d. Siemens Building Technologies
    e. Trane Co. (The); Tracer™ SC

2.2 DIRECT DIGITAL CONTROL (DDC) EQUIPMENT

A. Overall Conceptual Description

1. The FMS shall be designed entirely for use on intranets and internets. All networking technology shall be off the shelf, industry standard technology fully compatible with other owner provided networks in the facility.

2. All aspects of the user interface shall be accessed via standard web browsers (Chrome, Firefox, or Microsoft Edge). Access shall be via the internet or the Owner's LAN.

3. The user interface shall be complete as described herein, providing complete tool sets, operational features, multi- panel displays, and other display features.

B. General:

1. The FMS shall consist of a number of controllers and associated equipment connected by industry standard network practices. All communication between Controllers shall be by digital means only.

2. The FMS network shall at minimum comprise of the following:

    a. Network processing, data storage and communication equipment including file servers (provided under this contract).

    b. Routers, bridges, switches, hubs, modems and like communications equipment.

    c. Active processing Controllers included in field panels.

    d. Intelligent and addressable elements and end devices.

    e. Third-party equipment interfaces.

    f. Other components required for a complete and working FMS.

3. The servers and principal network equipment shall be standard products of recognized major manufacturers available through normal PC vendor channels.

4. Provide licenses for all software residing in the FMS system and transfer these licenses to the Owner prior to completion.

C. Network:

1. The FMS Network shall utilize an open architecture capable of all of the following:

a. Utilizing standard Ethernet communications and operate at a minimum speed of 10/100 Mb/sec.

b. Connecting via BACnet to any controller or controlled device in accordance with ANSI/ASHRAE Standard 135.

2. The FMS network shall support both copper and optical fiber communication media.

D. Controllers:

1. General: Provide an adequate number of Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC) as required to achieve performance specified. Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L.

2. Building Controllers (BCs): Each shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.

a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.

b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.

3. Advanced Application Controllers (AACs): Each AAC shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.

a. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

4. Application Specific Controllers (ASCs): Each ASC shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.

a. Each ASC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, using the ARCNET or MS/TP Data Link/Physical layer protocol.

b. Each ASC shall operate as a standalone controller capable of performing its specified control responsibilities independently of other controllers in the network.

c. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.

E. Downloading and Uploading:

1. Provide the capability to generate FMS software-based sequences, database items and associated operational definition information and user-required revisions to same at any Browser, and the means to download same to the associated controller.

2. Application software tool used for the generation of custom logic sequences shall be resident in both the application controller and the server(s) where indicated on the drawings.

3. Provide the capability to upload FMS operating software information, database items, sequences and alarms to the designated server(s).

4. The functions of this Part shall be governed by the codes, approvals and regulations applying to each individual FMS application.

2.3 WEB INTERFACE

A. General:

1. The FMS user interface shall be user friendly, readily understood and shall make maximum use of colors, graphics (including floor plan graphics), icons, embedded images, animation, text-based information and data visualization techniques to enhance and simplify the use and understanding of the FMS by authorized users.

2. User access to the FMS shall be protected by a flexible and Owner re-definable software-based password access protection. Each username shall be individually configurable with capabilities and restrictions relating to abilities (read or write) and specific building areas (wings, floors, entire building, etc.). It shall be possible to designate read ability in one area of the building with write ability in another area for each specific user.

B. Fault Detection and Diagnostics:

1. The system shall automatically monitor the operation of all building management panels and controllers. The failure of any device shall be annunciated to the Operator.

2. Alarm Processing: System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified in Sequences of Operation. Alarms shall be BACnet alarm objects and shall use BACnet alarm services.

3. Alarm Messages: Alarm messages shall use the English language descriptor for the object in alarm in such a way that the operator will be able to recognize the source, location, and nature of the alarm without relying on acronyms or mnemonics.

4. Alarm Reactions: Operator shall be able to configure (by object) what, if any actions are to be taken during an alarm. As a minimum, the workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.

5. Alarm and Event log: Operators shall be able to view all system alarms and changes of state from any location in the system. Events shall be listed chronologically. An operator with the proper security level may acknowledge and delete alarms and archive closed alarms to the workstation or web server hard disk. Provide an audit trail by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.

6. In addition to the BACnet alarm services and diagnostics, the FMS shall annunciate application alarms as required by Part 3 herein, the Sequence of Operation, and the Drawings where indicated.

7. The Owner shall have the ability to add or delete any alarm sequences and shall have the ability to route specific alarms from specific points to specific defined usernames.

C. Historical trending and data collection:

1. Trend and store point history data for all FMS points and values as selected by the user.

2. Provide sufficient server space to file all available points within the system for a period of fourteen (14) days in fifteen (15) minute intervals.

3. The trend data shall be stored in a manner that allows custom queries and reports using industry-standard software tools. The data shall also be configurable within the web interface to display trends in a graphic manner utilizing colors, editable data ranges, durations, legends, and axis descriptions.

4. At a minimum, provide the capability to perform statistical functions on the historical database:

a. Average.

b. Arithmetic mean.

c. Maximum/minimum values.

d. Range difference between minimum and maximum values.

e. Standard deviation.

f. Sum of all values.

g. Variance.

D. FMS Shop Drawing Graphics: Provide links within the Web Interface to corresponding controller (BC, AAC, and ASC) wiring diagrams pages from the final approved shop drawings.

2.4 CONTROL PANELS

A. Control Panels: Unitized cabinet with suitable brackets for wall or floor mounting, located adjacent to each system under automatic control. Provide common keying for all panels.

1. Fabricate panels of 0.06-inch-thick, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock, with manufacturer's standard shop-painted finish and color.

2. Panel-Mounted Equipment: Temperature and humidity controllers, relays, and automatic switch; except safety devices. Mount devices with adjustments accessible through front of panel.

3. Door-Mounted Equipment: Flush-mount (on hinged door) manual switches, including damper-positioning switches, changeover switches, thermometers, and gages.

4. Controller Diagrams: Provide a diagram inside the control panel indicating which wires landed on each controller correspond to which sensors, actuators, outputs, etc. consistent with corresponding pages within the final approved shop drawings. All hardcopy documents shall be laminated, legible, and permanently affixed inside the panel.

5. Controller Legend: Where controllers have a display screen displaying abbreviated names for sensors, actuators, setpoints, outputs, etc., provide a legend inside the control panel indicating the abbreviated and full name of each item.

2.5 SENSORS

A. Electronic Sensors: Vibration and corrosion resistant, for wall, immersion, or duct mounting as required.

1. Resistance Temperature Detectors or Thermistors:

a. Accuracy: Plus or minus 1ºF at calibration point.

b. Wire: Twisted, shielded-pair cable.

c. Insertion Elements in Ducts: Use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.

d. Averaging Elements in Ducts: Use where ducts are larger than 9 sq. ft. or where prone to stratification, length as required.

e. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.

f. Room Sensors: Match room thermostats, locking cover.

g. Outside Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

h. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

2. Humidity Sensors: Bulk polymer sensor element.

a. Accuracy: 5 percent full range with linear output.

b. Room Sensors: With locking cover matching room thermostats, span of 25 to 90 percent relative humidity.

c. Duct and Outside Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

3. Static-Pressure or Differential Pressure Transmitter: Non-directional sensor with suitable range for expected input, temperature compensated.

a. Accuracy: 2-percent of full scale with repeatability of 0.5 percent.

b. Output: 4 to 20 mA or 0 - 10 VDC.

c. Building Static-Pressure Range: 0 to 0.25 inch wg.

d. Duct Static-Pressure Range: 0 to 5 inches wg.

4. Differential Pressure Transducer (Velocity Pressure) for airflow measured applications:

a. Accuracy: 0.1% or better, of full scale.

b. Operating temperature limits: 32 - 122EF.

c. Outputs: 0-10 VDC or 4-20 mA.

d. Auto-Zero and temperature compensation capability.

5. Pressure Transmitters: Direct acting for gas, liquid, or steam service, range suitable for system, proportional output 4 to 20 mA or 0 - 10 VDC.

B. Equipment Operation Sensors: As follows:

1. Status Inputs for Fans: Differential-pressure switch with adjustable range of 0 to 5 inches wg.

2. Status Inputs for Pumps: Differential-pressure switch piped across pump with adjustable pressure-differential range of 8 to 60 psi.

3. Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

C. Airflow Switch: Paddle type with one-piece stainless-steel paddle suitable for measuring airflow and absence of airflow in ducts by responding only to the velocity of air movement. Furnish range adjusting screw to permit field adjustment to flow rate setting.

2.6 ROOM THERMOSTATS

A. Programmable Thermostat Controllers: Unit manufacturer's standard 7-day programmable model having an OFF-HEAT-AUTO-COOL-EM.HT system switch and an AUTO-ON fan switch. Provide multi-stage heating and cooling thermostat where controlled unit has multi-stage capability. Unit-mounted outdoor thermostat shall prevent strip heat from being energized above 45 degrees F. (Emergency heat position not required for non-heat pump unit.)

1. Furnish with the following:

a. Backlit Digital display of room temperature with buttons for setpoint adjustment.

b. Override capability.

c. Proportional plus integral control.

d. Automatic changeover.

e. Keypad lockout.

2.7 SPECIAL PURPOSE THERMOSTATS

A. Line-Voltage, ON-OFF Thermostats (Fan Control): Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch type, or equivalent solid-state type, with heat anticipator, integral manual ON-OFF-AUTO selector switch; UL listed for electrical rating.

1. Equip thermostats, which control electric heating loads directly, with OFF position on dial wired to break ungrounded conductors.

2. Dead Band: Maximum 2 deg F.

2.8 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or 2-position action.

1. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

2. Non-spring Return Motors for Valves Larger than 2-1/2 Inches: Size for running torque of 150 inch-pounds and breakaway torque of 300 inch-pounds.

3. Spring-Return Motors for Valves Larger than 2-1/2 Inches: Size for running and breakaway torque of 150 inch-pounds.

4. Non-spring-Return Motors for Dampers Larger than 25 sq. ft.: Size for running torque of 150 inch-pounds and breakaway torque of 300 inch-pounds.

5. Spring-Return Motors for Dampers Larger than 25 sq. ft.: Size for running and breakaway torque of 150 inch-pounds.

B. Electronic Operators: Select operator for full shutoff at maximum pump differential pressure.

2.9 DAMPERS

A. Dampers: AMCA-rated, parallel or opposed blade design; form frames from not less than 0.1084-inch galvanized steel with mounting holes for duct mounting; damper blades not less than 0.0635-inch galvanized steel, with maximum blade width of 8 inches.

1. Blades secured to 1/2-inch diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass. Ends sealed against spring-stainless-steel blade bearings. Thrust bearings at each end of every blade.

2. Operating Temperature Range: From -40 to 200 deg F.

3. For standard applications as indicated, (as selected by manufacturer's sizing techniques) with optional closed-cell neoprene edging.

4. For low-leakage applications (outdoor air) as indicated, provide parallel or opposed blade design (as selected by manufacturer's sizing techniques) with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm/sq. ft. of damper area, at differential pressure of 4 inches wg when damper is being held by torque of 50 inch-pounds; test in accordance with AMCA 500.

2.10 RELAYS

A. Control relays shall be UL listed plug-in type with dust cover. Contract rating, configuration and coil voltage suitable for application.

B. Time delay relays shall be UL listed solid state plug-in type with adjustable time delay. Delay shall be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration and coil voltage suitable for application. Provide NEMA 1 Type enclosure when not installed in local control panel.

2.11 TRANSFORMERS AND POWER SUPPLIES

A. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.

B. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.

C. Unit shall operate between 0 c and 50 c.

D. Unit shall be UL recognized.

2.12 SMOKE DETECTORS

A. Smoke detectors shall be located in the duct upstream of each smoke or combination fire/smoke damper. Detectors shall also be located on the wall adjacent to each smoke or combination fire/smoke damper located in plenum smoke partition.

B. In systems of over 2,000 cfm capacity smoke detectors approved for duct installation shall be installed at a suitable location in:

1. The main supply duct downstream of the unit filter and supply fan.

C. Smoke detectors and duct housings shall be provided under Division 26. Detectors shall be compatible with existing fire alarm system and shall be approved by the Owner.

D. Detectors and duct housings used to activate smoke dampers and shut down air handlers shall be mounted under Division 23. Detectors shall be mounted in accordance with NFPA 72.

1. Sampling tubes shall extend full width of duct.

2. Provide access door at smoke detector.

3. Test/reset switches for smoke detectors are furnished and installed under Division 26.

2.13 SMOKE DAMPERS AND COMBINATION SMOKE AND FIRE DAMPERS

A. Smoke dampers and combination smoke and fire dampers will be provided under Division 23. Control of dampers shall be under this section (HVAC Controls):

1. A status panel for smoke dampers shall be provided in the ceiling below the individual dampers. Panel shall contain a red neon pilot light that shall be illuminated when damper is closed.

a. Provide damper position interlock to ensure that smoke dampers are open 100% before air handling unit fan is started.

2.14 CONTROL CABLE

A. Electronic Cable for Control Wiring: Refer to Division 26 Sections.

B. Optical-Fiber Cable for Control Wiring: Refer to Division 26 Sections.

2.15 AIRFLOW CONTROL SYSTEMS (KITCHEN RANGEHOOD)

A. Kitchen Rangehood Systems:

1. Controls for kitchen rangehood fans, makeup air units, and fire suppression systems shall be furnished under other specification sections. Control wiring and control startup/commissioning shall be under this section. Provide additional wiring, relays, control transformers, and other devices as required to make the systems operational and integrate with building power and fire alarm systems.

2. See Sequence of Operation Sections for specific sequences.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field end devices and wiring are installed before proceeding with installation.

3.2 INSTALLATION

A. Install equipment as indicated to comply with manufacturer's written instructions.

B. Install software in control units and FMS server. Implement all features of programs to specified requirements and appropriate to sequence of operation.

C. Connect and configure equipment and software to achieve the sequence of operation specified.

D. Verify location of thermostats and other exposed control sensors with plans and room details before installation.

1. Install wall-mounted thermostats 4'-6" A.F., unless indicated otherwise. Coordinate mounting height with Architect.

2. Install wall-mounted thermostats minimum 8" away from door or window frames. Coordinate location with switches and other devices provided under other Divisions.

E. Provide locking covers on thermostats in the following locations:

1. Entrances.

2. Other public areas.

3. Other areas indicated on the Drawings.

F. Install damper motors on outside of duct in warm areas, not where exposed to outdoor temperatures.

G. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

H. Install labels and nameplates to identify control components according to Division 23 Sections specifying mechanical identification.

I. Install refrigerant instrument wells, valves, and other accessories according to Division 23 Section "Refrigerant Piping."

J. Install duct volume-control dampers according to Division 23 Sections specifying air ducts.

K. Install optical-fiber cable according to Division 26 Sections.

3.3 ELECTRICAL WIRING AND CONNECTIONS

A. Install raceways, boxes, and cabinets according to Division 26.

B. Install building wire and cable according to Division 26.

C. Install signal and communication cable in EMT, conduit or other raceway according to Division 26.

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.

2. Install exposed cable in raceway.

3. Install concealed cable in raceway.

4. Fasten flexible conductors, bridging cabinets and doors, neatly along hinge side; protect against abrasion. Tie and support conductors neatly.

5. Number-code or color-code conductors, except local individual room controls, for future identification and servicing of control system.

D. Connect electrical components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

E. Connect manual reset limit controls independent of manual control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

F. Connect HAND-OFF-AUTO selector switches to override automatic interlock controls when switch is in HAND position.

G. Make electrical connections to power supply and electrically operated meters and devices.

H. Where not indicated otherwise, obtain power for control units from the nearest un-switched receptacle circuit.

3.4 COMMISSIONING

A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to start control systems.

B. Test and adjust controls and safeties.

C. Replace damaged or malfunctioning controls and equipment.

D. Start, test, and adjust control systems.

E. Demonstrate compliance with requirements.

F. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

3.5 DEMONSTRATION

A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to demonstrate and train Owner's maintenance personnel as specified below.

1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

2. Schedule training with Owner with at least 7 days' notice.

3. Provide operator training on data display, alarm and status descriptors, requesting data, execution of commands, and request of logs. Include a minimum of (8) hours dedicated instructor time on-site.

END OF SECTION 230900

SECTION 230993
SEQUENCE OF OPERATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes control sequences for HVAC systems and terminal units.

B. Related Section: Division 23 Section "Control Systems Equipment" contains requirements that relate to this Section.

C. The Facility Management System (FMS) input/output summary is listed on the Drawings. Furnish listed points plus others required to achieve sequence of operation.

D. Where equipment is to operate using manufacturer supplied unit-mounted controls, integrate controls into the FMS utilizing a BacNet interface. Provide all necessary hardware and programming.

1.3 SAFETY AND RELIABILITY SYSTEMS

A. Smoke Detector/Air Handling Unit:

1. In systems with air handling capacity above 2,000 CFM and up to and including 15,000 CFM, the smoke detector mounted in the unit or main ductwork shall, when sensing smoke, shut down the Air Handing Unit. The smoke detectors shall be connected to the fire alarm system. The actuation of smoke detector shall activate a visible and supervisory signal at a constantly attended location. Where an outdoor condensing unit or heat pump is used it shall shut down those components.

2. Air-handling units shall deenergize on any general building fire alarm activation.

3. Integrate new air-handling equipment into the facility’s existing fire alarm shutdown sequence.

4. An emergency air handling system shutdown switch shall be located adjacent to the main fire alarm panel. All air handling units shall de-energize whenever the master shutdown switch located at the main fire alarm panel is activated.

5. Smoke evacuation fans and louvers shall be closed in non-alarm status.

B. Smoke (or Combination) Damper/Smoke Detector: Upon sensing smoke at the detector, the damper shall close. When the damper is closed, the indicator light shall illuminate on the ceiling below the damper.

C. Upon any fan system (i.e. air handling unit, exhaust fan) shutdown, all smoke dampers (or combination smoke/fire dampers) in that fan system’s duct system shall close. Coordinate damper closure sequence/fan system shutdown with fire alarm system contractor. Fan restart shall require damper end switch proof of opening in order to reenergize fan(s).

D. Auto Restart: All HVAC systems and equipment shall be configured such that normal operation is resumed after a power failure.

E. Dead Band: Where used to control both heating and cooling, zone thermostats shall be capable of providing a temperature dead band of at least 5ºF in accordance with ASHRAE standard 90.1.

F. Kitchen Rangehood Systems:

1. When fire is sensed on the cooking surfaces below the kitchen rangehood, the fire suppression system shall discharge.

2. When the fire suppression system is triggered, the natural gas valve serving cooking appliances shall close, and the shunt-trip circuit breakers serving the cooking appliances shall de-energize.

3. When the fire suppression system is triggered, the makeup air system shall de-energize, but the exhaust fan shall continue to run.

4. When the fire suppression system is triggered, the building fire alarm system shall receive notification.

1.4 CENTRAL PLANT SYSTEMS

A. Variable Refrigerant Flow (VRF) Systems:

1. The sequence of operation for VRF systems shall be in accordance with the system manufacturer's requirements, utilizing controllers furnished as part of the system.

2. In general, indoor heat pump units shall provide heat or cooling in response to their individual thermostat/controller.

3. The central system shall coordinate the operation of the outdoor and indoor units to provide for space temperature control, refrigerant flow control and compressor operation.

4. The VRF system controls shall be integrated into the FMS via a BacNet interface.

1.5 AIR HANDLING SYSTEMS

A. Dedicated Outdoor Air Systems (DOAS):

1. When scheduled to run by the DDC system, the intake dampers shall open and the supply fan shall energize. During unoccupied mode, the unit shall de-energize.

2. When the outdoor air temperature exceeds 60ºF, the evaporator coil controls shall operate in response to a temperature sensor downstream of the coil to maintain a constant discharge temperature of 53.5ºF. When the outdoor air temperature is below 60ºF, the refrigeration system shall not operate.

3. When the refrigeration system is in operation, the hot gas reheat coil shall operate to maintain the unit supply air temperature according to the following schedule.

Outdoor Air Temperature	Supply Temp Downstream of Reheat Coil
Above 60ºF	68ºF
Above 70ºF	65ºF
Above 80ºF	60ºF
Above 90ºF	55ºF

4. When the outdoor air temperature falls below 50ºF, the unit mounted natural gas heat shall be enabled. Once enabled, heating stages shall be energized as required to maintain a discharge temperature of 65ºF.

1.6 TERMINAL UNITS

A. Packaged Terminal Air Conditioner/Heat Pump:

1. Each individual heat pump shall be controlled by its unit mounted control panel and thermostat.

1.7 UNITARY SYSTEMS

A. Split Systems (ductless):

1. Split systems shall be controlled by individual thermostats furnished by the manufacturer. Heating or cooling shall be energized as required to maintain space temperature.

2. The systems serving the offices and other occupied spaces shall be scheduled by the FMS. The systems serving the dry goods storage room and data rooms shall be enabled continuously. DDC temperature sensors shall be used for monitoring and alarm in those spaces.

1.8 HEATING, VENTILATION AND HUMIDIFICATION SYSTEMS

A. Electric Unit Heaters: When space temperature falls below thermostat setpoint, the unit fan and heating coils shall energize.

B. Cabinet Heaters: Units shall be controlled by factory-supplied thermostats. A digital output from the FMS shall enable/disable ceiling heaters. Heaters shall be disabled whenever the outdoor temperature is above 65ºF (adj.)

C. Range Hood (Constant Volume):

1. Range Hood control panel shall have separate switches for supply fan and exhaust fan. Fans shall be interlocked such that supply fan cannot run unless exhaust fan is running.

2. Exhaust fan (and makeup unit) shall energize whenever switched on manually or when heat is detected in the hood.

3. When the makeup air unit fan is energized, heating (and cooling, if so equipped) stages shall be enabled. Heat (or cooling) stages shall be energized in response to the supply air thermostat.

4. When the makeup air unit is de-energized, the outdoor air intake damper shall be closed.

D. Fans: See fan schedule.

1. Where fans are indicated to be interlocked with room lighting, furnish starters/contactors as required for control operation.

2. Exhaust Fan: Where exhaust fan serves more than a single space; provide a line voltage relay for each room and connect relays in parallel so that turning lights on in any room will start exhaust fan.

3. Exhaust fans controlled by the FMS shall run continuously when the building is occupied. When unoccupied, these fans shall turn off.

E. Electric radiant heaters shall be controlled by an ON/OFF switch.

1.9 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Shop Drawings showing operating sequences of various equipment, devices, components, and materials included in the Text and defining the components' contribution to the system.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230993

SECTION 232300
REFRIGERANT PIPING AND CONDENSATE DRAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications, including pipes, tubing, fittings, and specialties; special-duty valves; and refrigerants. It also includes piping used for air conditioning condensate drainage.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data for each valve type and refrigerant piping specialty specified.

C. Shop Drawings showing layout of refrigerant piping, specialties, and fittings, including pipe and tube sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and equipment.

1. Refrigerant piping indicated is schematic only. Size and design the layout and installation of the piping, including oil traps, double risers, specialties, and pipe and tube sizes, to ensure proper operation and conformance with warranties of connected equipment.

D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.

E. Maintenance data for refrigerant valves and piping specialties to include in the operation and maintenance manual.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Qualify brazing and welding processes and operators according to ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications."

B. Regulatory Requirements: Comply with provisions of the following codes:

1. ASME B31.5, "Refrigeration Piping."

2. ASHRAE 15, "Safety Code for Mechanical Refrigeration."

C. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Nonelectrical"; or UL 429, "Electrically Operated Valves."

D. Listing and Labeling: Provide products specified in this Section that are UL listed and labeled.

1.5 SEQUENCING AND SCHEDULING

A. Coordinate the installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Refrigerants:

a. Allied Signal Inc.; Genetron Refrigerants.
b. DuPont Company; Fluorochemicals Div.
c. Elf Atochem North America, Inc.
d. ICI Americas Inc.; Fluorochemicals Bus.

2. Refrigerant Valves and Specialties:

a. Danfoss Electronics, Inc.
b. Eaton Corporation; Industrial Control Div.
c. Emerson Electric Company; Alco Controls Div.
d. Henry Valve Company.
e. Parker-Hannifin Corp.; Refrigeration & Air Conditioning Division.
f. Sporlan Valve Company.

2.2 PIPES AND TUBES

A. Copper Tube: ASTM B 280, Type ACR.

B. Copper Tube: ASTM B 88, Type L.

C. PVC Tube: Schedule 40.

2.3 PIPE AND TUBE FITTINGS

A. Copper Fittings: ASME B16.22, wrought-copper streamlined pattern.

2.4 JOINING MATERIALS

A. Brazing Filler Metals: AWS A5.8, Classification BAg-1 (Silver).

2.5 VALVES

A. Solenoid Valves: Conform to ARI 760; 250 deg F temperature rating, 400-psig working pressure; forged brass, with PTFE valve seat, 2-way straight-through pattern, and solder-end connections; manual operator; with NEMA 250, Type 1 solenoid enclosure with 1/2-inch conduit adapter, and 24-V normally closed holding coil.

B. Pressure-Regulating Valves: Conform to ARI 770; pilot operated, forged brass or cast bronze with pilot operator, stainless-steel bottom spring, pressure-gage tappings, 24-V dc standard coil, and wrought-copper fittings for solder-end connections.

C. Pressure-Regulating Valves: Conform to ARI 770; direct acting, brass with pilot operator, stainless-steel diaphragm, standard coil, and solder-end connections.

D. Pressure Relief Valves: Straight or angle brass body and disc, neoprene seat, factory sealed and ASME labeled, for standard pressure setting.

E. Thermal Expansion Valves: Conform to ARI 750; thermostatic-adjustable, modulating type; size as required and factory set for superheat requirements; solder-end connections; with sensing bulb, distributor having side connection for hot-gas bypass line, and external equalizer line.

F. Hot-Gas Bypass Valve: Adjustable, sized for capacity equal to last step of compressor unloading; solder-end connections.

2.6 REFRIGERANT PIPING SPECIALTIES

A. Moisture/Liquid Indicators: 500-psig operating pressure, 200 deg F operating temperature; forged-brass body, with replaceable, polished, optical viewing window with color-coded moisture indicator, and solder-end connections.

B. Permanent Filter-Dryer: 500-psig maximum operating pressure, 225 deg F maximum operating temperature; steel shell, and wrought-copper fittings for solder-end connections; molded-felt core surrounded by desiccant.

2.7 RECEIVERS

A. 6-Inch Diameter and Smaller: ARI 495, UL listed, steel, brazed; 400-psig pressure rating, with tappings for inlet, outlet, and pressure relief valve.

B. More than 6-Inch Diameter: ARI 495, welded steel, tested and stamped according to ASME Boiler and Pressure Vessel Code, Section 8D; 400 psig with tappings for liquid inlet and outlet valves, pressure relief valve, and liquid-level indicator.

2.8 REFRIGERANT

A. ASHRAE 34, R-410-A: Pentofluoroethane Difluouromethane.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for compliance with requirements for installation tolerances and other conditions affecting performance of refrigerant piping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Aboveground refrigerant piping: Type ACR copper tubing.

B. Exterior condensate drain piping: Type L copper tubing.

C. Interior condensate drain piping: Schedule 40 PVC with solvent welded joints.

3.3 INSTALLATION

A. Install refrigerant piping according to ASHRAE 15.

B. Basic piping installation requirements are specified in Division 23.

C. Install piping in short and direct arrangement, with minimum number of joints, elbows, and fittings.

D. Arrange piping to allow normal inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.

E. Install piping with adequate clearance between pipe and adjacent walls and hangers, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

F. Belowground, install copper tubing in conduit. Vent conduit outdoors.

G. Insulate refrigerant suction lines and hot gas lines. Insulate all refrigerant lines on inverter-driven split systems and variable refrigerant flow system.

1. Do not install insulation until system testing has been completed and all leaks have been eliminated.

H. Install branch lines to parallel compressors of equal length, and pipe identically and symmetrically.

I. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.

J. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope of 0.4 percent downward away from compressor.

2. Install horizontal suction lines with a uniform slope of 0.4 percent downward to compressor.

3. Install traps and double risers where indicated or where required to entrain oil in vertical runs.

4. Liquid lines may be installed level.

K. Use fittings for changes in direction and branch connections.

L. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

M. Reduce pipe sizes using eccentric reducer fittings installed with level side down.

N. Install refrigerant valves according to manufacturer's written instructions.

O. When brazing, remove solenoid-valve coils; remove sight glasses; and remove stems, seats, and packing of valves, and accessible internal parts of refrigerant specialties. Do not apply heat near bulb of expansion valve.

P. Electrical wiring for solenoid valves is provided under Division 23 and specified in Division 26 Sections. Coordinate electrical requirements and connections.

Q. Mount thermostatic expansion valves in any position, close to evaporator.

1. Where refrigerant distributors are used, mount directly on expansion-valve outlet.

2. Install valve so diaphragm case is warmer than bulb.

3. Secure bulb to clean, straight, horizontal section of suction line using 2 bulb straps. Do not mount bulb in a trap or at the bottom of the line.

4. Where external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

R. Install pressure relief valves as required by ASHRAE 15. Pipe pressure relief valves on receivers to outdoors.

S. Charge and purge systems, after testing, and dispose of refrigerant following ASHRAE 15 procedures.

T. Charge system per industry accepted standards for systems utilizing R-410A, or manufacturer's recommended procedures if more stringent than industry standards. The following is an outline of the triple evacuation method.

1. Pull initial vacuum on the line set testing for a leak. If it holds then pressure test with Nitrogen at 300 psi minimum.

2. Pump system down, recharge with Nitrogen to 2 psi. Perform this step two times.

3. Pump system down, re-pressurize with Nitrogen and then evacuate system to 500 microns. Hold for 30 minutes.

4. Break vacuum with refrigerant and charge per manufacturer's directions.

3.4 HANGERS AND SUPPORTS

A. General: Hangers, supports, and anchors are specified in Division 23 Sections. Provide according to ASME B31.5 and MSS SP-69.

B. Adjustable steel clevis hangers or swivel loop hangers for individual horizontal runs less than 20 feet in length.

C. Roller hangers and spring hangers for individual horizontal runs 100 feet or longer.

D. Pipe rollers for multiple horizontal runs, 100 feet or longer supported by a trapeze.

E. Spring hangers to support vertical runs.

F. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes. Tube sizes are nominal or standard tube sizes as expressed in ASTM B 88.

1. 1/2 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.

2. 5/8 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.

3. 1 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.

4. 1-1/4 Inches: Maximum span, 72 inches; minimum rod size, 1/4 inch.

5. 1-1/2 Inches: Maximum span, 96 inches; minimum rod size, 3/8 inch.

6. 2 Inches: Maximum span, 96 inches; minimum rod size, 3/8 inch.

7. 2-1/2 Inches: Maximum span, 108 inches; minimum rod size, 3/8 inch.

8. 3 Inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.

9. 4 Inches: Maximum span, 12 feet; minimum rod size, 1/2 inch.

G. Support vertical runs at each floor.

3.5 PIPE JOINT CONSTRUCTION

A. Basic pipe and tube joint construction is specified in Division 23 Sections.

B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent formation of scale.

3.6 VALVE INSTALLATIONS

A. Install refrigerant valves according to manufacturer's written instructions.

B. Provide liquid line solenoid valves for 7½-ton systems and larger, and where recommended by the HVAC equipment manufacturer.

1. Install solenoid valves in horizontal lines with coil at top.

2. Electrical wiring for solenoid valves is provided under Division 22 and specified in Division 26 Sections. Coordinate electrical requirements and connections.

C. Provide thermal expansion valve (TXV) or electronic expansion valve (EEV) on all systems:

1. For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system.

2. Size valves to provide full rated capacity of cooling coil serviced. Coordinate selection with evaporator coil and condensing unit.

3. Install valves in accordance with equipment and valve manufacturer’s instructions.

D. Install pressure-regulating and relief valves as required by ASHRAE 15.

3.7 SPECIALTIES APPLICATION AND INSTALLATION

A. Install liquid indicators in liquid line leaving condenser, in liquid line leaving receiver, and on leaving side of liquid solenoid valves.

B. Install pressure relief valves on ASME receivers, and pipe to outdoors.

C. Install filter-dryers in liquid line adjacent to receivers, coils and before each solenoid valve.

D. Install receivers on systems 5 tons and larger, and on systems with long piping runs, sized to accommodate pump-down charge.

3.8 CONNECTIONS

A. Electrical: Conform to applicable requirements of Division 26 Sections for electrical connections.

3.9 FIELD QUALITY CONTROL

A. Inspect and test refrigerant piping according to ASME B31.5, Chapter VI.

1. Pressure test with nitrogen per accepted industry practices using soap bubbles or electronic leak detector. Test to no leakage.

B. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

C. Repair leaks using new materials; retest.

3.10 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat requirements. Adjust hot gas bypass valve for proper unloading.

3.11 CLEANING

A. Before installation of copper tubing other than Type ACR, clean tubing and fittings with trichloroethylene.

3.12 COMMISSIONING

A. Charge system per industry accepted standards for systems utilizing R-410A, or manufacturer's recommended procedures if more stringent than industry standards. The following is an outline of the triple evacuation method.

1. Pull initial vacuum on the line set testing for a leak. If it holds then pressure test with Nitrogen at 300 psi minimum.

2. Pump system down, recharge with Nitrogen to 2 psi. Perform this step two times.

3. Pump system down, re-pressurize with Nitrogen and then evacuate system to 500 microns. Hold for 30 minutes.

4. Break vacuum with refrigerant and charge per manufacturer's directions.

END OF SECTION 232300

SECTION 233113
METAL DUCTWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract apply to this Section.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 23 Section "Duct Accessories" for flexible duct materials, dampers, duct-mounted access panels and doors, turning vanes, duct silencers, fabric ducts, pre-insulated outdoor ductwork, and turning vanes.

2. Division 23 Section "HVAC Insulation" for external duct and plenum insulation.

3. Division 23 Section "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.

4. Division 23 Section "Diffusers, Registers, Grilles and Louvers."

5. Division 23 Section "Control Systems Equipment" for automatic volume control dampers and operators.

6. Division 23 Section "Testing, Adjusting, and Balancing."

1.2 SUMMARY

A. This Section includes rectangular and round metal ducts and plenums for heating, ventilating, and air conditioning systems in pressure classes from minus 4 inches to plus 10 inches water gage.

1.3 DEFINITIONS

A. Sealing Requirements Definitions: For the purposes of duct systems sealing requirements specified in this Section, the following definitions apply:

1. Seams: A seam is defined as joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. All other duct surface connections made on the perimeter are deemed to be joints.

2. Joints: Joints include girth joints; branch and subbranch intersections; so-called duct collar tap-ins; fitting subsections; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum, and casing abutments to building structures.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. The duct system design, as indicated, has been used to select and size air moving and distribution equipment and other components of the air system. Changes or alterations to the layout or configuration of the duct system must be specifically approved in writing. Accompany requests for layout modifications with calculations showing that the proposed layout will provide the original design results without increasing the system total pressure.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract.

B. Product data including details of construction relative to materials, dimensions of individual components, profiles, and finishes for the following items:

1. Duct Liner.

2. Sealing Materials.

C. Shop drawings from duct fabrication shop, drawn to a scale not smaller than ¼-inch equals 1-foot, on drawing sheets same size as the Contract Drawings, detailing:

1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.

2. Duct layout, indicating pressure classifications and sizes in plan view. For exhaust ducts systems, indicate the classification of the materials handled as defined in this Section.

3. Fittings.

4. Reinforcing details and spacing.

5. Seam and joint construction details.

6. Penetrations through fire-rated and other partitions.

7. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.

D. Coordination drawings for ductwork installation in accordance with Division 23 Sections. In addition to the requirements specified, show the following:

1. Coordination with ceiling suspension members.

2. Spatial coordination with other systems installed in the same space with the duct systems.

3. Coordination of ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.

4. Coordination with ceiling-mounted lighting fixtures and air outlets and inlets.

E. Welding certificates including welding procedures specifications, welding procedures qualifications test records, and welders' qualifications test records complying with requirements specified in "Quality Assurance" below.

F. Record drawings including duct systems routing, fittings details, reinforcing, support, and installed accessories and devices

G. Maintenance data for volume control devices, fire dampers, and smoke dampers.

1.6 QUALITY ASSURANCE

A. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel" for hangers and supports and AWS D9.1 "Sheet Metal Welding Code."

B. Qualify each welder in accordance with AWS qualification tests for welding processes involved. Certify that their qualification is current.

C. NFPA Compliance: Comply with the following NFPA Standards:

1. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," except as indicated otherwise.

2. NFPA 96, "Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors for Commercial Cooking Equipment," Chapter 3, "Duct System," for kitchen hood duct systems, except as indicated otherwise.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and fire-stopping materials to site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle sealant materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

C. Deliver and store stainless steel sheets with mill-applied adhesive protective paper, maintained through fabrication and installation.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Sheet Metal, General: Provide sheet metal in thicknesses indicated, packaged and marked as specified in ASTM A 700.

B. Galvanized Sheet Steel: Lock-forming quality, ASTM A 527, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.

C. Reinforcement Shapes and Plates: Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts. For aluminum and stainless steel ducts provide reinforcing of compatible materials.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 DUCT LINER

A. General: Comply with NFPA Standard 90A.

B. Materials: ASTM C 1071, Type II, with coated surface exposed to airstream to prevent erosion of glass fibers.

1. Thickness: 1 inch.

2. Density: 1-1/2 pounds.

3. Thermal Performance: "K-Factor" equal to 0.28 or better, at a mean temperature of 75 deg F.

4. Fire Hazard Classification: Flame spread rating of not more than 25 without evidence of continued progressive combustion and a smoke developed rating of no higher than 50, when tested in accordance with ASTM C 411.

5. Liner Adhesive: Comply with NFPA Standard 90A and ASTM C 916.

6. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct. Provide fasteners that do not damage the liner when applied as recommended by the manufacturer, that do not cause leakage in the duct, and will indefinitely sustain a 50-pound tensile dead load test perpendicular to the duct wall.

    a. Fastener Pin Length: As required for thickness of insulation, and without projecting more than 1/8 inch into the airstream.

    b. Adhesive for Attachment of Mechanical Fasteners: Comply with the "Fire Hazard Classification" of duct liner system.

2.3 SEALING MATERIALS

A. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for class 1 ducts.

B. Joint and Seam Sealant: One-part, non-sag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657, Type I; formulated with a minimum of 75 percent solids.

C. Flanged Joint Mastics: One-part, acid-curing, silicone elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.4 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.

B. Hangers: Galvanized sheet steel, or round, zinc plated steel, threaded rod.

1. Hangers Installed in Corrosive Atmospheres: Electro-galvanized, all-thread rod or hot-dipped-galvanized rods with threads painted after installation.

2. Straps and Rod Sizes: Conform with Table 4-1 in SMACNA HVAC Duct Construction Standards, 1995 Edition, for sheet steel width and gage and steel rod diameters.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes conforming to ASTM A 36.

1. Where galvanized steel ducts are installed, provide hot-dipped-galvanized steel shapes and plates.

2. For stainless steel ducts, provide stainless steel support materials.

3. For aluminum ducts, provide aluminum support materials, except where materials are electrolytically separated from ductwork.

2.5 RECTANGULAR DUCT FABRICATION

A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards," Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.

1. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.

2. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

3. Square throat, round heel elbows shall not be used.

2.6 SPECIAL DUCT FABRICATION

A. Exhaust ducts for domestic range-hoods installed in commercial applications shall be constructed of smooth-wall duct construction of minimum 26-gauge galvanized steel.

2.7 STATIC PRESSURE CLASSIFICATION

A. Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:

1. Low Pressure Supply Ducts: 1-inch water gage.

2. Return Ducts: 1-inch water gage, negative pressure.

3. Low Pressure Exhaust Ducts: 1-inch water gage, negative pressure.

B. Cross-breaking or Cross Beading: Cross-break or bead duct sides that are 19 inches and larger and are 20 gage or less, with more than 10 sq. ft. of unbraced panel area, as indicated in SMACNA "HVAC Duct Construction Standard," Figure 1-4, unless they are lined or are externally insulated.

2.8 RECTANGULAR DUCT FITTINGS

A. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard," 1995 Edition, Figures 2-1 through 2-10.

2.9 SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness is prohibited.

B. Apply a coat of adhesive to liner facing in direction of airflow not receiving metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to assure butted edge overlapping.

E. Longitudinal joints in rectangular ducts shall not occur except at corners of ducts, unless the size of the duct and standard liner product dimensions make longitudinal joints necessary.

1. Apply an adhesive coating on longitudinal seams in ducts exceeding 2,500 FPM air velocity.

F. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely around perimeter; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

G. Secure transversely oriented liner edges facing the airstream with metal nosing that are either channel or "Z" profile or are integrally formed from the duct wall at the following locations:

1. Fan discharge.

2. Intervals of lined duct preceding unlined duct.

3. Upstream edges of transverse joints in ducts.

H. Terminate liner with duct buildouts installed in ducts to attach dampers, turning vane assemblies, and other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to the duct wall with bolts, screws, rivets, or welds. Terminate liner at fire dampers at connection to fire damper sleeve through fire separation.

2.10 ROUND DUCT FABRICATION

A. General: "Basic Round Diameter" as used in this article is the diameter of the size of round duct that has a circumference equal to the perimeter of a given sized of flat oval duct. Except where interrupted by fittings, provide round and flat oval ducts in lengths not less than 12 feet.

B. Round Ducts: Fabricate round supply ducts with spiral lock-seam construction, except where diameters exceed 72 inches. Fabricate ducts having diameters greater than 72 inches with longitudinal butt-welded seams. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gages.

2.11 ROUND DUCT SUPPLY AND EXHAUST FITTINGS FABRICATION

A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to conform to SMACNA "HVAC Duct Construction Standards," 1995 Edition, Figures 3-4 and 3-5 and with metal thicknesses specified for longitudinal seam straight duct.

B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from the body onto branch tap entrance.

C. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate the bend radius of die-formed, gored, and pleated elbows 1.5 times the elbow diameter. Unless elbow construction type is indicated, provide elbows meeting the following requirements:

1. Mitered Elbows: Fabricate mitered elbows with welded construction in gages specified below.

a. Mitered Elbows Radius and Number of Pieces: Unless otherwise indicated, construct elbow to comply with SMACNA "HVAC Duct Construction Standards," Table 3-1.

b. Round Mitered Elbows: Spot welded and bonded with metal thickness listed below for pressure classes from minus 2 inches to plus 2 inches:

1) 3 to 26 inches: 24 gage.

2) 27 to 36 inches: 22 gage.

3) 37 to 50 inches: 20 gage.

4) 52 to 60 inches: 18 gage.

5) 62 to 84 inches: 16 gage.

c. Round Mitered Elbows: Spot welded and bonded with metal thickness listed below for pressure classes from 2 inches to 10 inches:

1) 3 to 14 inches: 24 gage.

2) 15 to 26 inches: 22 gage.

3) 27 to 50 inches: 20 gage.

4) 52 to 60 inches: 18 gage.

5) 62 to 84 inches: 16 gage.

d. Flat Oval Mitered Elbows: Spot welded and bonded with the same metal thickness as longitudinal seam flat oval duct.

e. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems, or exhaust systems for material handling classes A and B; and only where space restrictions do not permit the use of 1.5 bend radius elbows. Fabricate with a single-thickness turning vanes.

2. Round Elbows - 8 Inches and Smaller: Die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 3-1/2- and 4-1/2-inch) elbows with gored construction.

3. Round Elbows - 9 Through 14 Inches: Gored or pleated elbows for 30, 45, 60, and 90 degrees, except where space restrictions require a mitered elbow. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 9-1/2- and 10-1/2-inch) elbows with gored construction.

4. Round Elbows - Larger Than 14 Inches and All Flat Oval Elbows: Gored elbows, except where space restrictions require a mitered elbow.

5. Die-Formed Elbows for Sizes Through 8 Inches and All Pressures: 20 gage with 2-piece welded construction.

6. Round Gored Elbows Gages: Same as for non-elbow fittings specified above.

7. Pleated Elbows Sizes Through 14 Inches and Pressures Through 10 Inches: 26 gage.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

A. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.

B. Install ducts with the fewest possible joints.

C. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.

D. Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.

E. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any.

H. Install insulated ducts with 1-inch clearance outside of insulation.

I. Conceal ducts from view in finished and occupied spaces by locating them in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.

J. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

K. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

L. Non-Fire-Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2 inches.

M. Low pressure supply duct takeoffs shall be equivalent to Crown 306 or equal by Flexmaster or United McGill. Medium pressure takeoffs shall be conical type.

N. Low pressure round duct runouts to supply diffusers may be "snap-lock" duct meeting the pressure classification.

O. Exposed round duct shall be medium pressure spiral duct with mill-phosphatized treatment. Prime and paint - color selected by the Design Professional.

3.2 SEAM AND JOINT SEALING

A. General: Seal duct seams and joints as follows:

1. Conditioned Spaces:

a. Supply duct pressure classification 2-inches water gage and greater and exhaust ducts: All transverse joints and longitudinal seams.

b. Supply duct pressure classification less than 2-inches water gage and all return duct: All transverse joints and longitudinal seams.

c. Return and Exhaust Duct: Al transverse joints and longitudinal seams.

2. Unconditioned Spaces:

a. Supply duct pressure classification 2-inches water gage and greater: All transverse joints, longitudinal seams, and duct wall penetrations.

b. Supply duct pressure classification less than 2-inches water gage and all return duct: All transverse joints, and longitudinal seams.

c. Return and Exhaust Duct: All transverse joints.

3. Outdoor Spaces:

a. All supply and return duct: All transverse joints, longitudinal seams, and duct wall penetrations.

b. Exhaust Duct: All transverse joints.

B. Solvent based sealant shall only be used in applications where freezing may occur before sealant is cured. Water-based sealant shall be used in all other applications.

C. Seal externally insulated ducts prior to insulation installation.

D. All duct sealing shall be in accordance with ASHRAE standard 90.1.

3.3 HANGING AND SUPPORTING

A. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards," Chapter 5.

B. Support horizontal ducts within 2-feet of each elbow and within 4-feet of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet and at each floor.

D. Upper attachments to structures shall have an allowable load not exceeding 1/4 of the failure (proof test) load but are not limited to the specific methods indicated.

E. Install concrete insert prior to placing concrete.

F. Install powder actuated concrete fasteners after concrete is placed and completely cured.

3.4 CONNECTIONS

A. Equipment Connections: Connect equipment with flexible connectors in accordance with Division 23 Section "Duct Accessories."

B. Branch Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-7 and 2-8.

C. Outlet and Inlet Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-16 through 2-18.

D. Low pressure round supply duct takeoffs shall be equivalent to Crown 306 adjustable 45-degree takeoff. Other acceptable manufacturers include, but are not limited to, Flexmaster and United McGill.

3.5 FIELD QUALITY CONTROL

A. Disassemble, reassemble, and seal segments of the systems as required to accommodate leakage testing, and as required for compliance with test requirements.

B. All ductwork shall be approved by the Design Professional prior to the application of external insulation. In the absence of such approval, smoke testing, pressure testing or other leakage testing of ductwork shall be required.

C. Conduct duct pressure tests in the presence of the Design Professional after the testing has demonstrated that the duct system meets the stated leakage criteria.

D. Determine leakage from entire medium pressure system or section of the system by relating leakage to the total system airflow capacity.

E. The following systems shall be pressure tested in accordance with SMACNA's HVAC Air Duct Leakage Test Manual, and meet the stated criteria:

1. Medium pressure supply ductwork: test at 4.5 inches water column static pressure, with a maximum allowable leakage rate of 0.5%.

2. Medium pressure exhaust ductwork: test at 2.0 inches water column static pressure, with a maximum leakage of 1%.

3. Low pressure supply ductwork: test at 1.0 inches water column static pressure, with a maximum leakage of 1%.

4. Low pressure return and exhaust ductwork: test at 1.0 inches water column static pressure, with a maximum leakage of 1%.

F. Do not pressurize systems above the maximum design operating pressure (static pressure classification.) Give 7 days' advanced notice for testing.

G. Remake leaking joints as required and apply sealants to achieve specified maximum allowable leakage. Integrity of ductwork shall be approved by the Design Professional prior to application of insulation.

3.6 ADJUSTING AND CLEANING

A. Adjust volume control devices as required by the testing and balancing procedures to achieve required air flow. Refer to Division 23 Section "TESTING, ADJUSTING, AND BALANCING" for requirements and procedures for adjusting and balancing air systems.

B. Vacuum ducts systems prior to final acceptance to remove dust and debris.

END OF SECTION 233113

SECTION 233300
DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Manual volume control dampers.
3. Fire and smoke dampers.
4. Turning vanes.
5. Duct-mounted access doors and panels.
6. Flexible connectors.
7. Flexible ducts.
8. Accessories hardware.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 23 Section "Diffusers, Registers, Grilles and Louvers" for diffusers, registers, and grilles.
2. Division 23 Section "Controls Systems Equipment" for HVAC control devices.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract.

B. Product data including details for materials, dimensions of individual components, profiles, and finishes for the following items:

1. Backdraft dampers.
2. Manual volume control dampers.
3. Fire and smoke dampers.’
4. Duct-mounted access panels and doors.
5. Flexible ducts.

C. Shop drawings from manufacturer detailing assemblies. Include dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Detail the following:

1. Special fittings and volume control damper installation (both manual and automatic) details.

2. Fire and smoke damper installations, including sleeves and duct-mounted access door and panel installations.

D. Product Certification: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static pressure loss, and dimensions and weights.

E. Maintenance data for volume control devices, fire dampers, and smoke dampers

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA Standards:

1. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

2. NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."

1.5 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protect items from damage during shipping, storage and handling.

B. Where possible, store products inside and protect from weather. Where necessary to store outside, store above grade and enclose with a vented waterproof wrapping.

PART 2 - PRODUCTS

2.1 BACKDRAFT DAMPERS

A. Description: Suitable for horizontal or vertical installation.

B. Frame: 18-gage galvanized steel, with welded corners and mounting flange.

C. Blades: 0.025-inch-thick roll-formed aluminum.

D. Blade Seals: Felt.

E. Blade Axles: Galvanized steel.

F. Tie Bars and Brackets: Galvanized steel.

G. Return Spring: Adjustable tension.

H. Chain Operator: 15-foot long galvanized-steel sash chain and pulley.

I. Wing-Nut Operator: Galvanized steel, with 1/4-inch galvanized-steel rod.

2.2 MANUAL VOLUME CONTROL DAMPERS

A. General: Provide factory-fabricated volume-control dampers, complete with required hardware and accessories. Stiffen damper blades to provide stability under operating conditions. Provide locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class. Provide end bearings or other seals for ducts with pressure classifications of 3 inches or higher. Extend axles full length of damper blades. Provide bearings at both ends of operating shaft.

B. Standard Volume Control Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside of air stream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized-steel channels, minimum of 16 gage, and with mitered and welded corners. Provide frames with flanges where indicated for attaching to walls. Provide flangeless frames where indicated for installation in ducts.

2. Roll-Formed Steel Blades: 16-gage galvanized steel.

3. Blade Axles: Galvanized steel.

4. Tie Bars and Brackets: Galvanized steel.

C. Jackshaft: 1-inch-diameter, galvanized-steel pipe or 1/2" square galvanized bar stock rotating within a pipe bearing assembly mounted on supports at each mullion and at each end of multiple damper assemblies. Provide appropriate length and number of mounting to connect linkage of each damper of a multiple damper assembly. Cut groove in the end of the shaft parallel with damper blades.

D. Damper Control Hardware: Zinc-plated, die-cast core with a heavy-gage dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Provide center hole to suit damper operating rod size. Provide elevated platform for insulated duct mounting.

2.3 FIRE DAMPERS

A. General: UL labeled according to UL Standard 555 "Standard for Fire Dampers." Ratings shall be for dynamic system operation at 350º temperature.

1. Dampers used in low pressure systems shall be rated for 2000 fpm velocity and 4" wg pressure.

2. Dampers used in medium pressure systems (VAV supply and medium pressure exhaust) shall be rated for 3000 fpm and 8" wg pressure.

B. Fire Rating: 1-1/2 or 3 hours, as indicated by wall ratings on Architectural Plans.

C. Frame: Type B (blades outside airstream); fabricated with roll-formed, 21-gage, galvanized-steel; with mitered and interlocking corners. Furnish multi-blade dampers where required by code.

D. Mounting Sleeve: Factory-installed or field-installed galvanized steel.

1. Minimum Thickness: 0.056-inch (16-gage) or 0.138-inch (10-gage) thick as indicated, and length to suit application.

2. Exception: Furnish narrow frame damper without sleeve in applications where damper is mounted in rated partition behind supply/return register.

E. Mounting Orientation: Vertical or horizontal as indicated.

F. Blades: Roll-formed, interlocking, 21-gage galvanized steel. In place of interlocking blades, provide full-length, 21-gage, galvanized-steel blade connectors.

G. Fusible Link: Replaceable, 165 deg F rated.

2.4 CEILING FIRE DAMPERS

A. General: UL listed and labeled; comply with the construction details for the tested floor/roof-ceiling assemblies as indicated in the UL Fire Resistance Directory.

B. Frame: 20-gage, rectangular or round, galvanized steel; style to suit ceiling construction.

C. Blades: 22-gage galvanized steel with non-asbestos refractory insulation.

D. Volume Control Adjustment: Provide UL-labeled, fusible volume control adjustment.

E. Fusible Link: Replaceable, 165 deg F rated.

2.5 SMOKE AND FIRE/SMOKE DAMPERS

A. General: UL-labeled according to UL Standard 555S, "Standard for Leakage Rated Dampers for Use in Smoke Control Systems." Combination fire and smoke dampers shall also be UL-labeled for 1-1/2-hour rating according to UL Standard 555 "Standard for Fire Dampers with a Class II leakage rating." Dampers shall be tested at a 350E air temperature.

1. Dampers used in low pressure systems shall be rated for 2000 fpm velocity and 4" wg pressure.

2. Dampers used in medium pressure systems (VAV supply and medium pressure exhaust) shall be rated for 3000 fpm and 8" wg pressure.

B. Fusible Link: Replaceable, 165 deg F rated as indicated (fire/smoke dampers only.)

C. Frame and Blades: 16-gage galvanized steel.

D. Mounting Sleeve: Factory-installed, 18-gage galvanized steel, length to suit wall or floor application.

E. Pneumatic (electric) actuator with end switch. All actuators shall be factory mounted outside of the airstream. Furnish damper end switch for control interlocks

2.6 TURNING VANES

A. Fabricate turning vanes according to SMACNA HVAC Duct Construction Standards, Figures 2-2 through 2-7.

B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch-wide, curved blades set at 3/4 inch on center, support with bars perpendicular to blades set at 2 inches on center and set into side strips suitable for mounting in ducts.

C. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fiber glass fill.

2.7 DUCT-MOUNTED ACCESS DOORS AND PANELS

A. General: Provide construction and airtightness suitable for duct pressure class.

B. Frame: Galvanized sheet steel. Provide with bend-over tabs and foam gaskets.

C. Door: Double-wall, galvanized sheet metal construction with insulation fill and thickness, number of locks as indicated for duct pressure class. Provide vision panel where indicated. Provide cam latches.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber seals.

E. Insulation: 1-inch-thick fiber glass or polystyrene foam board.

2.8 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL Standard 181, Class 1.

B. Standard Metal-Edged Connectors: Factory-fabricated with a strip of fabric 3-1/2 inches wide attached to 2 strips of 2-3/4-inch-wide, 24-gage, galvanized sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected duct system. Fold and crimp metal edge strips onto fabric as illustrated in SMACNA HVAC Duct Standard, 3rd Edition, Figure 7-8.

C. Extra-Wide Metal-Edged Connectors: Factory-fabricated with a strip of fabric 5-3/4 inches wide attached to 2 strips of 2-3/4-inch-wide, 24-gage, galvanized sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected duct system. Fold and crimp metal edge strips onto fabric as illustrated in SMACNA HVAC Duct Standard, 1st Edition, Figure 2-19.

D. Conventional, Indoor System Flexible Connectors Fabric: Glass fabric double coated with polychloroprene.

1. Minimum Weight: 26 oz./sq. yd.

2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.

E. Conventional, Outdoor System Flexible Connectors Fabric: Glass fabric double coated with Du Pont's HYPALON or other synthetic-rubber weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.

1. Minimum Weight: 26 oz./sq. yd.

2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.

2.9 FLEXIBLE DUCTS

A. General: Comply with UL 181, Class 1.

B. Flexible Ducts - Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch-thick, glass fiber insulation around a continuous inner liner.

1. Reinforcement: Steel-wire helix encapsulated in the inner liner.

2. Outer Jacket: Glass-reinforced, silver mylar.

3. Inner Liner: Polyethylene film.

4. Pressure Rating: 10-inches wg, positive.

5. R value = 6.0

C. Woven Polypropylene Hanging Strap:

1. Hanging straps shall be manufactured of woven polypropylene 1¾" wide and having a minimum 400-pound tensile strength.

2. Strap material shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50.

3. Strap material shall be manufactured for flexible HVAC duct support and shall be installed in accordance with the manufacturer's instructions and SMACNA standards.

4. Straps shall be used on flexible ducts only, and not on rigid ductwork.

2.10 ACCESSORIES HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket and a flat mounting gasket. Size to allow insertion of pitot tube and other testing instruments and provide in length to suit duct insulation thickness.

B. Splitter Damper Accessories: Zinc-plated damper blade bracket, 1/4-inch, zinc-plated operating rod, and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

C. Flexible Duct Clamps: Stainless steel band with cadmium-plated hex screw to tighten band with a worm-gear action. Provide in sizes from 3 to 18 inches to suit duct size.

D. Adhesives: High strength, quick setting, neoprene based, waterproof and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of duct accessories. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install duct accessories according to manufacturer's installation instructions and applicable portions of details of construction as shown in SMACNA standards.

B. Install volume control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner.

C. Provide test holes at fan inlet and outlet and elsewhere as indicated.

D. Install fire and smoke dampers according to the manufacturer's UL-approved printed instructions.

E. Install fusible links in fire dampers.

F. Label access doors according to Division 23 Section "Mechanical Identification."

3.3 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire and smoke dampers for proper action.

C. Final positioning of manual dampers is specified in Division 23 Section "Testing, Adjusting, and Balancing."

END OF SECTION 233300

SECTION 233423
POWER AND GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Centrifugal roof ventilators.

2. Ceiling-mounted ventilators.

3. Fly fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base air ratings on sea-level conditions.

B. Operating Limits: Classify according to AMCA 99.

C. Fan Unit Schedule: The following information is described in an equipment schedule on the Drawings.

1. Fan performance data including capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

2. Fan arrangement including wheel configuration, inlet and discharge configurations, and required accessories.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data including rated capacities of each unit, weights (shipping, installed, and operating), furnished specialties, accessories, and the following:

1. Certified fan performance curves with system operating conditions indicated.

2. Certified fan sound power ratings.

3. Motor ratings and electrical characteristics plus motor and electrical accessories.

4. Material gages and finishes, including color charts.

5. Dampers, including housings, linkages, and operators.

C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

D. Coordination Drawings, according to Division 23 sections for roof penetration requirements and for reflected ceiling plans drawn accurately to scale and coordinating penetrations and units mounted above ceiling. Show the following:

1. Roof framing and support members relative to duct penetrations.

2. Ceiling suspension assembly members.

3. Size and location of initial access modules for acoustical tile.

4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

E. Wiring diagrams detailing wiring for power and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

F. Maintenance data for power ventilators to include in the operation and maintenance manual.

1.5 QUALITY ASSURANCE

A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.

B. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

C. AMCA Compliance: Provide products that meet performance requirements and are licensed to use the AMCA Seal.

D. NEMA Compliance: Provide components required as part of fans that comply with applicable NEMA standards.

E. UL Standard: Provide power ventilators that comply with UL 705.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements. Verify clearances.

B. Do not operate fans until ductwork is clean, filters are in place, bearings are lubricated, and fans have been commissioned.

1.7 COORDINATION AND SCHEDULING

A. Coordinate the size and location of structural steel support members.

B. Coordinate the installation of roof curbs, equipment supports, and roof penetrations.

1.8 EXTRA MATERIALS

A. Furnish one set of belts for each belt-driven fan that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Acme
2. Barry Blower
3. Berner
4. Broan Mfg. Co., Inc.
5. Carnes Co.
6. Central Blower Co.
7. Cincinnati Fan & Ventilator Co.
8. Cook (Loren) Co.
9. Essick Air Products, Breidert.
10. Greenheck Fan Corp.
11. Hartzell
12. ILG Industries, Inc.
13. Jenn Industries Inc.
14. Lau Division Philips Industries, Inc.
15. Mars
16. Penn
17. Twin City

2.2 CENTRIFUGAL ROOF VENTILATORS

A. Description: Belt-driven or direct-drive centrifugal fans, as indicated, consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Up-blast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt-Driven Drive Assembly: Resiliently mounted to the housing, with the following features:

1. Fan Shaft: Turned, ground, and polished steel drive shaft keyed to wheel hub.

2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.

3. Pulleys: Cast-iron, adjustable-pitch motor pulley.

4. Fan and motor isolated from exhaust air stream.

E. Accessories: The following items are required as indicated:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 percent to less than 50 percent.

2. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

3. Bird Screens: Removable 1/2-inch mesh, aluminum or brass wire.

4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

5. Roof Curbs: Galvanized steel; mitered and welded corners; 2-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 2-inch wood nailer. Size as required to suit roof opening and fan base.

   a. Overall Height: 12 inches above roof surface.

2.3 CEILING-MOUNTED VENTILATORS

A. Description: Centrifugal fans designed for installing in ceiling or wall, or for concealed in-line applications.

B. Housing: Galvanized steel.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille (Ceiling Mounted): Aluminum grille with baked enamel finish. Furnish in-line configuration where indicated.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in. (Integral disconnect device.)

F. Variable-Speed Controller: Solid-state control to reduce speed from 100 percent to less than 50 percent.

G. Accessories: Manufacturer's standard roof jack or wall cap, and transition fittings where indicated on the drawings.

2.4 FLY FAN

A. Fan shall have single speed motor and door switch. Fan shall be full width of the door over which it is installed. Fan shall be NSF-37 listed.

2.5 MOTORS

A. Refer to Division 23 sections for general requirements for factory-installed motors.

B. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B. Furnish premium efficiency motors for all above 1 horsepower.

C. Enclosure Type: The following features are required as indicated:

1. Open drip-proof motors where satisfactorily housed or remotely located during operation.

2. Guarded drip-proof motors where exposed to contact by employees or building occupants.

2.6 FACTORY FINISHES

A. Sheet Metal Parts: Prime coat before final assembly.

B. Exterior Surfaces: Baked-enamel finish coat after assembly.

C. Aluminum Parts: No finish required.

2.7 SOURCE QUALITY CONTROL

A. Testing Requirements: The following factory tests are required as indicated:

1. Sound Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings From Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA Seal.

2. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements of installation tolerances and other conditions affecting performance of the power ventilators. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install power ventilators according to manufacturer's written instructions.

B. Support units using the vibration-control devices indicated. Vibration-control devices are specified in Division 23 Sections.

1. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. Furnish a minimum of one screw per side of the curb.

2. Ceiling Units: Suspend units from structure using steel wire or metal straps.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Division 23.

3.3 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.

B. Electrical: Conform to applicable requirements in Division 26 Sections.

C. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly of components and installation of fans, including duct and electrical connections, and to report results in writing.

3.5 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

3.6 CLEANING

A. After completing installation, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes including chips, scratches, and abrasions.

B. Clean fan interiors to remove foreign material and construction debris. Vacuum clean fan wheel and cabinet.

3.7 COMMISSIONING

A. Final Checks before Startup: Perform the following operations and checks before startup:

1. Verify that shipping, blocking, and bracing are removed.

2. Verify that unit is secure on mountings and supporting devices and that connections for piping, ducts, and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnects.

3. Perform cleaning and adjusting specified in this Section.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.

5. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.

6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in the fully open position.

7. Disable automatic temperature-control operators.

B. Starting procedures for fans are as follows:

1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.

2. Measure and record motor voltage and amperage.

C. Shut unit down and reconnect automatic temperature-control operators.

D. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for procedures for air-handling-system testing, adjusting, and balancing.

E. Replace fan and motor pulleys as required to achieve design conditions.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

B. Review data in the operation and maintenance manuals.

C. Schedule training with Owner, through the Design Professional, with at least 7 days' advance notice.

D. Demonstrate operation of power ventilators.

END OF SECTION 233423

SECTION 233713
DIFFUSERS, REGISTERS, GRILLES AND LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, grilles and louvers.

1.3 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

D. Louver: Exterior wall air device which resists the penetration of rain.

1.4 SUBMITTALS

A. Product Data: For each model indicated, include the following:

1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.

2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.

3. Schedule of diffusers, registers, grilles and louvers indicating drawing designation, room location, quantity, model number, size, and accessories furnished.

4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

B. Coordination Drawings: Reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in ceilings and walls.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings and schedules indicate specific requirements of diffusers, registers, grilles and louvers and are based on the specific requirements of the systems indicated. Other manufacturers' products with equal performance characteristics may be considered.

B. NFPA Compliance: Install diffusers, registers, grilles and louvers according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Acceptable manufacturers shall be:

1. Anemostat Products
2. Arrow
3. Carnes Co.
4. Greenheck
5. Hart and Cooley
6. Tuttle and Bailey
7. Krueger
8. J&J
9. Nailor
10. Titus
11. Metal*Aire
12. Vent Products
13. Price
14. Dowco
15. Ruskin

B. All louver face ceiling diffusers shall have four cones and removable cores.

C. All exterior louvers shall be 6-inches deep.

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, grilles and louvers are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, grilles and louvers level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where Design Professional features or other items conflict with installation, notify Design Professional for a determination of final location.

C. Install diffusers, registers, grilles and louvers with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, grilles and louvers to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers, grilles and louvers, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION 233713

SECTION 233813
RANGE HOOD SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes kitchen range hoods.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 23 sections for hangers and supports.

2. Division 23 sections for metal ductwork.

3. Division 26 sections for miscellaneous electrical sections.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product data for each range hood, including the following:

1. Unit Weight.

2. Furnished Accessories.

3. Installation and Startup Instructions.

C. Shop drawings detailing fabrication and installation of range hood, including plans, elevations, sections, component details, attachments, and other construction elements. Include the following:

1. Dimensions.

2. Weight loadings and distribution.

3. Clearances for maintenance and operation.

4. Size and location of field connections.

5. Mounting details.

6. Wiring diagrams.

D. Maintenance data for each hood system to included in the Operating and Maintenance Manual.

E. Certification letter from the manufacturer stating that the rangehood system has been through startup procedures and that it is functioning properly.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in manufacturing range hood systems similar to those indicated for this Project and that have a record of successful in-service performance.

B. Installer Qualifications: Engage an experienced installer who has successfully installed similar range hoods.

C. U.L. Listing: Hood shall bear the U.L. Listed nameplate in accordance with U.L. 710.

D. NFPA Compliance: Hood shall be constructed in accordance with NFPA Standard 96 requirements and 120-3-3 modifications to NFPA-96.

E. NSF Compliance: Hood shall bear the National Sanitation Foundation seal of approval.

F. Fire suppression installer shall have a pre-engineered kitchen fire suppression system license.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Protect hood system and components from damage by factory packing.

B. Acceptance on Site: Reject any damaged hood system upon arrival.

C. Storage and Protection: Store hood system and components to prevent damage, and protect from weather, dirt, fumes, water, and construction debris. Store indoors where possible.

D. Handling: Handle hood systems and components according to manufacturer's instructions.

1.6 WARRANTY

A. Written manufacturer's warranty covering parts and labor for product failures within 12 months of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following manufacturers:

1. Kitchenette Range Hoods:

a. Amana Refrigeration, Inc.
b. Broan Mfg. Co.
c. Chambers Corp.
d. General Electric
e. Hotpoint
f. Sears, Roebuck & Co.
g. Modern Maid, Raytheon Co.
h. Whirlpool Home Appliance
i. White-Westinghouse

2. Kitchenette Range Hood Fire Suppression Systems:

a. Ansul
b. Twenty First Century, Guardian I System
c. Pem All Fire Extinguishing, Safety Gourmet
d. Accurex

2.2 KITCHENETTE RANGE HOODS

A. Ventilating Type Range Hood with the following features:

1. 30" hood for mounting below wall cabinets.
2. 2-speed fan
3. Permanent washable filter
4. Built-in lighting
5. Color indicated on schedules.
6. Rated at 160 feet per minute face velocity.
7. Recirculating or ducted as indicated on schedules.

2.3 KITCHENETTE RANGE TOP FIRE SUPPRESSION SYSTEM

A. Refer to Architectural Drawings, Kitchen Equipment Drawings and Mechanical Drawings. Provide Fire Suppression system and nozzles for each Cooking Appliance, Hood, Filters and Plenum.

B. General: The fire extinguishing system shall be capable of detecting a cooking grease fire originating on the range top, extinguish the fire, and prevent reignition, while at the same time, shutting off the gas or electric supply to surface elements on the kitchen range top and providing a signal to the fire alarm system. Each system shall be provided with a means to distribute. the chemical agent, fire detection components, container for storing the chemical, valve assembly with pressure gauge, mounting bracket for container, and appliance shut-off device. Except for shut-off device, these components shall be provided factory assembled and ready for installation.

C. Certification: The fire extinguishing system shall have a current U.L. Listing.

D. Chemical Agent: Wet Chemical: Shall conform to the requirements of National Fire Protection Association (NFPA) Standard No. 17A for Wet Chemical Fire Extinguishing Systems.

E. Cylinder and Valve Assembly:

1. The extinguisher cylinder and valve assembly shall be provided fully charged with chemical and pressurized with dry nitrogen in accordance with Listed requirements. A pressure gauge attached to the valve assembly shall be positioned to allow visual inspection when installed within a kitchen cabinet. Maximum allowable height of container (including valve assembly and mounting bracket) shall not exceed 12 inches. The container and valve assembly shall be of the reserviceable type. The container and valve assembly shall be provided factory assembled to the mounting bracket. Assembly shall include a pre-mounted activation switch for the appliance shut-off device, actuation spring and necessary attachment for the Fire Detection Unit.

2. The complete extinguisher cylinder and valve assembly shall be installed in a protected area above the range hood (normally, kitchen cabinets). Installation which exposes extinguisher cylinder and valve assembly to direct cooking heat and grease will not be accepted.

F. Appliance Nozzles: Wet System: Appliance nozzles shall be constructed of brass, stainless steel or a combination thereof. Appliance nozzles with painted surfaces shall not be accepted. Appliance nozzles shall not extend below the lowest component of the hood.

G. Fire Detection Unit: The fire protection unit shall consist of 1/16-inch stainless steel cable, "S" hooks, cable crimps, corner pulleys and fusible links and other hardware for a complete installation. These components shall be provided factory assembled as one complete unit. Each fire detection unit, when installed, shall provide a thermal link over each cooking surface burner, have no exposed cable ends protruding under range hood, and prevent detection components from splattering grease during system actuation. Components shall not extend (when installed) below the lowest component of the hood. The temperature rating of thermal links shall prevent pre-mature system actuation from normal cooking temperatures common with residential type gas and/or electric range top burners.

H. Chemical Agent Distribution Component: Rigid Piping and Flexible Hose for Wet Chemical: Rigid, Schedule 40 black steel pipe, malleable iron pipe fittings and flexible hose shall be provided factory assembled and ready for installation into kitchen cabinet space. The use of copper tubing shall not be accepted. Pipe, pipe fittings and flexible hose shall comply with National Fire Protection Association (NFPA) Standard No. 17A for Wet Chemical Extinguishing Systems. The combination of pipe and flexible hose shall be U.L. Listed.

I. Appliance Shut-Down Device:

1. Each System shall be provided with a Listed device to automatically shut-off the gas or electric supply to surface burners on the range top upon actuation of the fire extinguishing system. The gas or electric supply shall remain "off" until manually reset. A Listed Manual Reset Relay Control unit or other Listed device shall be used for this purpose. A U.L. approved mechanically operated manual reset gas valve shall be provided. Electrical power cut-off to kitchen range hood exhaust fan shall not be required for UL Listed fire extinguishing systems.

2. Range top shut-off devices shall comply with local codes and regulations. The Contractor shall provide appliance shut-down equipment.

3. Extinguishing systems shall be equipped with switching equipment to activate the shut-off devices and alarms or other equipment. Switch shall have provision for either "normally open" circuit, a "normally closed" circuit or both.

J. Owner's Manual: Provide a comprehensive owner's manual that shall contain procedures to follow in the event of a cooking grease fire, post clean-up procedures, parts identification, complete wiring diagram, system installation with pictorials for step-by-step procedures, system limitations, inspection and maintenance requirements. Re-servicing/recharging procedures shall also be contained in the owner's manual or the owner’s manual shall reference a recognized re-servicing publication.

PART 3 - EXECUTION

3.1 INSTALLATION AND CERTIFICATION

A. Installation:

1. Installation shall be in strict accordance with the manufacturer's printed Installation Instructions.

2. All wiring and conduit associated with the control of rangehood system fans and devices shall be provided under this Division. This includes wiring between the remote-control panel at the fan package, the switch panel in the kitchen space, and the temperature interlock control panel.

3. Installation of system shall be made only by persons properly trained and qualified to install the specific system being provided. System shall be installed, inspected, and tested by manufacturer's Authorized Representative. Training shall be by the manufacturer of the equipment being installed.

4. The installer shall submit a Letter of Certification to the State Fire Marshal (with copy to the Architect) that the installation is in complete agreement with the terms of the listing and the manufacturer's instructions and/or approved design.

END OF SECTION 233813

SECTION 234000
BIPOLAR IONIZATION AIR PURIFICATION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This section describes the design, performance and installation of a bipolar ionization air purification system intended for use as part of another manufacturer's air handling unit or mounted on the duct as shown on the plans, details and equipment schedules.

1.3 REFERENCED CODES & STANDARDS

A. The following codes and standards are referenced throughout. The edition to be used is that currently enforced by the authority having jurisdiction (AHJ) or in absence of such direction that referenced by the current enforceable IBC code or as indicated by the contract documents, except where specifically referenced by this section of the specifications.

1. ASHRAE Standards 62 & 52

2. National Electric Code NFPA 70

3. UL 867

1.4 QUALITY ASSURANCE

A. The bipolar ionization air purification system shall be a product of an established manufacturer in the USA.

B. A qualified representative from the manufacturer shall be available to inspect the installation of the air purification system to ensure installation in accordance with manufacturer's recommendation.

C. Technologies that do not address gas disassociation such as UV lights, powered particulate filters and/or polarized media filters shall not be considered. Uni-polar ion generators shall not be acceptable. "Plasma" particulate filters shall not be acceptable.

D. Projects designed using ASHRAE Standard 62.1 *IAQ Procedure* shall require the manufacturer to provide Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2007 or later version to validate acceptable indoor air quality at the quantity of outside air scheduled.

E. The bipolar ionization system shall have been tested by UL or Intertek/ETL to prove conformance to UL 867-2007.

F. The maximum allowable ozone concentration per the UL 867-2007 chamber test shall be 0.001 PPM. The maximum peak ozone concentration per the UL 867-2007 peak test as measured 2 inches away from the output of the bipolar ionization unit shall be no more than 0.0012 PPM. Manufacturers with ozone output exceeding these ozone values shall not be acceptable.

G. Electrical Component Standard: Provide components that comply with NFPA 70 "National Electrical Code."

H. NEMA Compliance: Provide electrical components required as part of filter assembly that are listed and labeled by UL and comply with applicable NEMA standards.

I. Listing and Labeling: Provide electrical components that are listed and labeled.

1. The Terms "Listed and Labeled": As defined in the "National Electrical Code," Article 100.

J. NFPA Compliance: Comply with applicable portions of NFPA 90A and 90B.

1.5 SUBMITTALS

A. Submit manufacturer's technical product data for ion generators including:

1. Schedule of bipolar ionization units indicating model number and quantity of each type required for each application.

2. Submittal sheet for each type of bipolar ionization unit and accessories furnished; indicating construction, dimensions, electrical data, and mounting details.

3. Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2007 or later version to validate acceptable indoor air quality at the quantity of outside air scheduled (when projects are designed with reduced outside air).

4. Product drawings detailing all physical, electrical and control requirements.

B. Operating & Maintenance Data: Submit O&M data and recommended spare parts list.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of products shall be in factory fabricated shipping cartons. Identify on outside of carton the type of product contained within. Avoid crushing or bending.

B. Store in original cartons and protect from weather and construction work traffic.

C. Store indoors and in accordance with the manufacturers’ recommendation for storage.

1.7 WARRANTY

A. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of twelve months after shipment or eighteen months from owner acceptance, whichever occurs first. Labor to replace equipment under warranty shall be provided by the owner or installing contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Aerisa
2. Air Oasis
3. Bioclimatic
4. Global Plasma Solutions (GPS)
5. Plasma Air

2.2 GENERAL

A. The air purification system(s) shall be of the size, type, arrangement and capacity indicated and required by the unit scheduled.

B. All other suppliers of comparable products requesting prior approval shall:

1. Submit a request for prior approval at least 15 days prior to bid date. Requests received after that time will not be considered.

2. In addition, as part of the prior approval request, Bipolar Ionization manufacturers must submit their IAQ calculations that prove conformance to ASHRAE Standard 62.1-2007 or later version with the reduction of outside air to the scheduled values. A letter on the manufacturer's letterhead requesting prior approval must accompany the request for prior approval stating their calculations are ASHRAE compliant. A third-party validation study performed on a previous installation of the same application shall also be included.

3. Submit independent test data from ETL or UL on the ozone chamber test.

4. Submit at least two other end user references in the same application with contact phone number, email, equipment used and application at that facility. Manufacturers not having the above references in similar applications using the same equipment models as proposed on the current project shall not be acceptable.

2.3 BI-POLAR IONIZATION DESIGN & PERFORMANCE CRITERIA

A. Each piece of air handling equipment, so designated on the plans, details, equipment schedules and/or specifications shall contain a plasma ion generator with bipolar ionization output as described here within.

B. The bipolar ionization system shall be capable of:

1. Effectively killing microorganisms downstream of the bipolar ionization equipment (e.g., mold, bacteria, virus).

2. Controlling gas phase contaminants generated from human occupants, building structure, furnishings and outside air contaminants.

3. Reducing space static charges.

4. Reducing space particle counts.

C. The bipolar ionization system shall operate in such a manner that equal amounts of positive and negative ions are produced. Uni-polar (or single pole) ion devices shall not be acceptable.

1. Airflow rates may vary through the full operating range of a VAV system. The quantity of air exchange shall not be increased due to requirements of the air purification system.

2. Velocity Profile: The air purification device shall not have a maximum velocity profile.

D. Humidity: Plasma Generators shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100%, condensing, shall not cause damage, deterioration or dangerous conditions to the air purification system.

E. Ionization Equipment Requirements:

1. Electrode Specifications (bipolar ionization):

a. Each plasma generator with bipolar ionization output shall include the required number of electrodes and power generators sized to the air handling equipment capacity. Bipolar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, performance output reduction over time and corrosion.

b. Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating.

c. Ionization output from each electrode shall be a minimum of 5-million ions/cc when tested at 2” from the ion generator.

d. Manufacturer shall demonstrate that no voltage potential exists due to exposed electrical components in the duct system or plenum.

2. Units Mounted in Airstream:

a. Bipolar ionization units for fan-mounted and duct-mounted applications shall be brush type needlepoint units.

b. Each bipolar ionization unit shall be rated for the airflow it will be treating.

c. The bipolar unit housing is made of acrylonitrile butadiene styrene, contains an LED ionization output-indicator, and an in-line 1 Amp fuse.

d. The unit shall contain two (2) mounting feet such that when mounted, the needlepoint brushes are oriented perpendicular to the flow.

3. Certifications:

a. Bipolar ionization units shall be tested and listed by either UL or ETL according to UL Standard 867 – Electrostatic Air Cleaners.

b. The operation of the electrodes or bipolar ionization units shall conform to UL 867 with respect to ozone generation.

F. Electrical Requirements:

1. Ion generators shall directly accept voltage provided from the voltage provided from the fan coil unit or air handling unit served. Ion generators requiring a loose transformer or power supply will not be accepted.

2. Wiring, conduit and junction boxes shall be furnished and installed by the electrical contractor within housing plenums and shall be UL and NEC NFPA 70 approved.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall be responsible for maintaining all air systems until the owner accepts the building (Owner Acceptance).

3.2 ASSEMBLY & INSTALLATION: PLASMA GENERATOR WITH BI-POLAR IONIZATION

A. All equipment shall be assembled and installed with a high level of workmanship to the satisfaction of the Owner and Design Professional.

B. Any material damaged by handling, water or moisture shall be replaced by the mechanical contractor at no cost to the owner.

C. All equipment shall be protected from damage on a daily basis throughout construction.

D. Install electrical devices in accordance with manufacturer’s instructions and with electrical divisions of the specifications.

3.3 COMMISSIONING & TRAINING

A. A manufacturer's authorized representative shall provide start-up supervision and training of Owner's personnel in the proper operation and maintenance of all equipment.

END OF SECTION 234000

SECTION 237432
PACKAGED DEDICATED OUTSIDE AIR UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes dehumidification units used for swimming pool room dehumidification and packaged makeup air units.

B. Related Sections include the following:

1. Division 23 Section "Mechanical Vibration Controls and Seismic Restraints" for manufactured isolation bases.

2. Division 23 Section "Control Systems Equipment" for temperature-control devices, and control wiring and control devices connected to packaged makeup air units.

1.3 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities of selected model clearly indicated; dimensions; required clearances; shipping, installed, and operating weights; furnished specialties; accessories; and installation and startup instructions.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

C. Commissioning Reports: Indicate results of startup and testing commissioning requirements. Submit copies of checklists.

D. Maintenance Data: For equipment to include in the operations and maintenance manuals.

E. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

B. Listing and Labeling: Provide electrically operated components specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

C. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver units as factory-assembled units with protective crating and covering.

B. Coordinate delivery of units in sufficient time to allow movement into building.

C. Handle units to comply with manufacturer's written rigging and installation instructions for unloading and moving to final location.

1.6 COORDINATION

A. Coordinate installation of pads and equipment supports

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: A written warranty, executed by the manufacturer and signed by the Contractor, agreeing to replace components that fail in materials or workmanship, within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.

1. Warranty Period, Compressors: Manufacturers standard, but not less than 5 years after date of Material Completion.

2. Warranty Period, Heat Exchangers: Manufacturer’s standard, but not less than 10 years after date of material completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Filters: Three (3) sets of filters for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Dedicated Outside Air Units:

a. AAON
b. Captive Aire
c. Greenheck
d. Mitsubishi
e. Trane Co. (The)
f. Valent

2.2 PACKAGED DEDICATED OUTSIDE AIR UNITS

A. Unit Description:

1. Unit shall be a packaged rooftop unit specifically designed for 100% outdoor applications. Unit shall be completely factory-assembled, tested, internally wired, fully charged and shipped in one piece. Unit(s) shall consist of insulated weather-tight casing with outdoor intake hood, compressors, air-cooled condenser coils, condenser fans, evaporator coils, supply fan, motors and drives, unit controls, condenser reheat coil, gas-fired heat and filters.

2. Unit shall be single piece construction as manufactured at the factory. Packaged units shall be constructed for installation on a roof curb.

3. Unit shall be factory run tested to include the operation of all fans, compressors, heat exchangers, safeties, limits and control sequences.

B. Unit Casing:

1. Cabinet: Outer casing shall be 18-gauge minimum A60 galvaneal steel painted with baked industrial enamel finish. Internal casing shall be 24-gauge minimum G90 galvanized steel except for motor supports, which shall be 14-gauge minimum G90 galvanized steel. Panels shall be insulated with 2” thick fiberglass insulation or 2” spray foam insulation.

2. Access panels/doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge minimum painted galvanealed steel.

3. Control Panel: the unit control panel section shall be laid out to provide separation high and low voltage components per UL requirements. The control panels shall also be fully gasketed, hinged and provided with quick release latch and door for easy access.

C. Electrical:

1. Provide a factory-installed non-fused disconnect switch which satisfies NEC requirements for a service disconnect switch. Disconnect handle shall be accessible through the control box door such that high voltage power must be off before door can be opened.

2. Provide a factory installed 115V convenience outlet capable of ground fault protection.

D. Air Filters: Filters shall mount integral within unit casing and be accessible through hinged access panels. Filters shall be 2-inch-thick pleated media throwaway filter, MERV-8 efficiency.

E. Fans - Supply: Supply fan blower assembly shall consist of an electric motor and direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails mounted on 1.125” thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.

F. Gas Fired Heating Section:

1. Provide gas-fired heating section as a completely assembled and factory-installed heating system integral to unit, UL approved specifically for outdoor applications for use downstream from refrigerant cooling coils and tested under AHSI Standard Z21.471993, Standard for Gas-fired Central Furnaces. Provide capability for threaded gas piping connection through side of unit.

2. Heating section shall be factory run tested prior to shipment.

3. Gas Burner shall have a 409 stainless steel burner with combustion air supply, gas valve, intermittent spark pilot ignition. Burners shall include flared ports and a stainless steel insert.

4. Gas Burner Safety Controls: Provide safety controls for the providing of combustion air prior to ignition, and continuous flame supervision. The gas heater shall have continuous re-ignition. If the pilot is not established in 120-seconds, the gas heat shall lock out and must be reset by interrupting power to the gas heat control circuit.

5. Furnace control shall be 12:1 modulating.

6. Combustion blower shall be double-width, double-inlet FC centrifugal type fan with built-in thermal overload protection on fan motor.

7. Heat Exchanger: Provide 409 stainless-steel heat exchanger with venturi-design tubes. Factory pressure and leak tested.

8. Gas heaters shall be constructed of grades of stainless steel suitable for condensing environments.

9. Limit Controls: High temperature limit controls will shut off gas flow in the event of excessive temperatures resulting from restricted airflow or loss of indoor airflow.

G. Evaporator Coil Section:

1. Provide two individual evaporator coils with heavy duty aluminum fins mechanically bonded to copper tubes and mounted to a single coil and support. Evaporator coils shall be independently circuited to optimize cooling and drying capacity at full and part load conditions. Coils shall also utilize internally enhanced tubing for maximum efficiency.

2. Provide a thermostatic expansion valve (TXV) for each refrigerant circuit. Factory pressure and leak test call at 390 psig.

3. Provide drain pan pitched in two planes that is fully drainable. Drain pan shall be double-wall foamed in place assembly constructed of stainless steel. Evaporator coils to be mounted above drain pan to allow the drain pan to be fully inspected and cleaned.

H. Condenser Reheat Coil Section:

1. Provide reheat coil for recovered hot refrigerant gas with heavy duty aluminum fins mechanically bonded to copper tubes. Factory pressurize and leak test to 390 psig.

2. Provide integral subcooling circuit to prevent premature refrigerant flashing and to ensure maximum operating efficiency.

3. Reheat coil system to provide modulating reheat capacity between the reheat coil and matching outdoor condenser coil as required per the supply air temperature setpoint via the unit micro processor.

4. Reheat coil to be factory installed in unit with adequate spacing away from upstream evaporator coils to prevent entrained moisture from reentering the reheated supply air.

I. Condenser Section:

1. Provide heavy duty aluminum fins mechanically bonded to copper tubes. Factory pressurize and leak test to 390 psig.

2. Provide sub-cooling circuit(s) integral with condenser coils to maximize operating efficiency and prevent premature refrigerant flashing.

3. Provide vertical discharge, direct drive fans with steel blades and three phase motors. Fans shall be statistically and dynamically balanced. Motors shall be permanently lubricated with built in current and thermal overload protection and have weather tight slingers over motor bearings.

4. Provide factory-installed louvered seel coil guards around perimeter of condensing section to protect the condenser coils, refrigerant piping and control components. Louvered panels shall be fabricated from minimum 20-gauge galvanized steel and be rigid enough to provide permanent protection for shipping and pre/post-installation.

J. Refrigeration system:

1. Compressor: Hermetic digital scroll compressor with isolated mounting and electric crankcase heater.

2. Provide thermostatic temperature motor winding control for protection against excessive temperature caused by over/under-voltage operation or loss of charge. Provide high and low pressure cutouts.

3. Provide integral coil frost protection based on refrigerant circuit suction temperature.

K. Outdoor Air Section:

1. Provide 100% outdoor air via a fully integrated factory installed 100% modulating outdoor air damper. Damper operation shall be through microprocessor-based controls and shall remain open at 100% when the building is occupied for required ventilation.

2. Provide spring return motor for outside air damper closure during unit shutdown or power interruption.

3. Outdoor air inlet hood to be factory installed with bird screen.

L. Dampers:

1. Provide low leakage dampers.

2. Outside air damper shall be parallel blades. A modulating damper actuator shall be factory installed and controlled via the unit microprocessor.

M. DDC Microprocessor Controls: The unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) capable of controlling the unit as a stand-alone system and capable of interface with the owner's facility management system through a factory provided BACNet interface. The unit controller shall incorporate an integral LCD screen providing text readouts of status and have a built-in keypad to permit access of read-out screens without the use of ancillary equipment, devices, or software

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide all labor, refrigerant, and material required for a complete installation. Work to be performed shall be in accord with local codes, regulations, and OSHA standards.

3.2 DELIVERY, STORAGE AND HANDLING

A. Provide a suitable space for the equipment with proper access and entries. Store in a clean, dry place and protect from the outdoor environment. Handle with care to avoid damage.

3.3 INSTALLATION

A. Install unit per plans and manufacturer's installation recommendations.

3.4 FIELD QUALITY CONTROL

A. Clean, check and perform all preliminary start-up procedures before final operation of the unit, per manufacturer's recommendations.

B. Provide complete operation/maintenance manuals (in English) and include the following minimum lists: parts list, electrical and control drawings, and refrigeration piping drawings. Manufacturer's representative shall instruct owners/operators of the unit regarding its functions and sequence of operation.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventative maintenance.

2. Review data in the maintenance manuals.

3. Schedule training with Owner, through the Design Professional, with at least 7 day's advance notice.

END OF SECTION 237432

SECTION 238113
PACKAGED TERMINAL AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes packaged, freestanding or through-the-wall, terminal air-conditioning and heat-pump units, and their accessories and controls.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, weights, furnished specialties, and accessories for each model indicated.

B. Shop Drawings: Detail layout and installation of wall penetrations.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For equipment to include in the maintenance manuals.

D. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

B. Energy Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

C. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Listing and Labeling: Provide electrically operated components specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

E. Comply with AGA Z223.1 for gas-fired furnace section.

F. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of units and wall construction where unit penetrates wall or is supported by it.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: A written warranty, executed by the manufacturer and signed by the Contractor, agreeing to replace components that fail in materials or workmanship within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.

1. Warranty Period, Compressors: Manufacturers standard, but not less than 5 years after date of Material Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Amana
2. Climate Master, Inc.
3. Daiken
4. GE Co.
5. Gree
6. LG

2.2 MANUFACTURED UNITS

A. Description: Packaged, self-contained, through-the-wall terminal units with room cabinet, electric refrigeration system, heating, and temperature controls; fully charged with refrigerant and filled with oil.

B. Cabinet: 0.052-inch-thick, galvanized steel with removable front panel with concealed latches.

1. Mounting: Floor with subbase and wall sleeve.

2. Finish: Baked enamel.

3. Discharge Grille and Access Door: Louver discharge grilles allowing for adjustable discharge air pattern, with hinged door in top of cabinet for access to controls.

4. Subbase: Enameled steel with adjustable leveling feet and adjustable end plates, with factory-installed and -wired, fused disconnect switch and receptacle sized for unit.

5. Wall Sleeves: 0.064-inch-thick, galvanized steel with polyester finish.

6. Louvers: Extruded aluminum with enamel finish. Color selected by the Design Professional.

C. Refrigeration System: Direct-expansion indoor coil with capillary restrictor, hermetically sealed compressor with internal spring isolation, external isolation, permanent-split-capacitor motor, and overload protection. Include the following:

1. Outdoor coil and fan.

2. Coaxial tube-in-tube condenser with water-regulating valve.

3. Accumulator.

4. Capillary restrictor and constant-pressure expansion valve.

5. Reversing valve.

D. Air System: Forward-curved, centrifugal, indoor fans with permanent-split-capacitor motor, permanent washable filters, and positive-pressure ventilation damper with concealed manual operator.

E. Electric-Resistance Heating Coil: Nickel-chromium wire, electric-resistance heating elements with contactor and high-temperature-limit switch.

F. Condensate Drain: Drain pan to direct condensate to outdoor coil for re-evaporation.

G. Outdoor Fan: Forward curved, centrifugal with separate permanent-split-capacitor motor.

2.3 CONTROLS

A. Control Module: Unit-mounted adjustable thermostat with heat anticipator, off-heat-auto-cool switch, and high-low fan switch.

B. Low Ambient Lockout Control: Prevents cooling cycle operation below 40 deg F, outdoor-air temperature.

C. Heat-Pump Ambient Control: Field-adjustable switch changes from heat-pump operation to electric-resistance heating between 35 and 60 deg F.

2.4 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Factory test to comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."

B. Unit Performance Ratings: Factory test to comply with ARI 310/380, "Packaged Terminal Air-Conditioners and Heat Pumps."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units according to manufacturer's written instructions.

B. Coordinate installation of wall sleeves in finished wall assembly; seal and weatherproof.

3.2 CONNECTIONS

A. Electrical: Connect units to wiring systems and to ground as indicated and instructed by manufacturer.

B. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes including chips, scratches, and abrasions.

3.4 COMMISSIONING

A. After installation, check the following:

1. Unit is level on base and is flashed in exterior wall.

2. Unit casing has no visible damage.

3. Furnace combustion chamber has no visible damage.

4. Compressor, air-cooled condenser coil, and fans have no visible damage.

5. Labels are clearly visible.

6. Furnace flue and condenser are clean and free of construction debris.

7. Controls are connected and operable.

8. Shipping bolts, blocks, and tie-down straps are removed.

9. Filters are installed and clean.

10. Drain pan and drain line are installed correctly.

11. Burner and controls are suitable to operate at temperatures as low as minus 40 deg F.

12. Acoustic insulation is present.

B. Lubricate bearings on fan.

C. Check fan-wheel rotation for correct direction without vibration and binding.

D. Start unit according to manufacturer's written instructions.

1. Complete manufacturer's startup checks.

E. After starting and performance test, change filters.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

2. Review data in the maintenance manuals.

3. Schedule training with Owner through the Design Professional, with at least 7 days' advance notice.

END OF SECTION 238113

SECTION 238126
SPLIT SYSTEM HEAT PUMPS AND AIR CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes split system heat pump units and related components.

1.3 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities of selected model clearly indicated; dimensions; required clearances; shipping, installed, and operating weights; furnished specialties; accessories; and installation and startup instructions.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

2. Refrigerant piping schematics showing sizes and accessories.

C. Commissioning Reports: Indicate results of startup and testing commissioning requirements. Submit copies of checklists.

D. Maintenance Data: For equipment to include in the maintenance manuals.

E. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

B. Energy Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

C. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Listing and Labeling: Provide electrically operated components specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

E. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver indoor and outdoor units as factory-assembled units with protective crating and covering.

B. Coordinate delivery of units in sufficient time to allow movement into building.

C. Handle units to comply with manufacturer's written rigging and installation instructions for unloading and moving to final location.

1.6 COORDINATION

A. Coordinate installation of concrete pads and equipment supports

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: A written warranty, executed by the manufacturer and signed by the Contractor, agreeing to replace components that fail in materials or workmanship, within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.

1. Warranty Period, Compressors: Manufacturers standard, but not less than 5 years after date of Material Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Filters: Three sets of filters for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Ductless Split Systems:

a. Carrier Corp.
b. Daikin
c. Gree Comfort
d. LG
e. Mitsubishi
f. Samsung
g. Sanyo
h. Trane

2.3 DUCTLESS SPLIT SYSTEMS

A. Provide a split system heat pump and air conditioning units utilizing outdoor condenser and indoor evaporator connected by copper refrigerant tubing with flare type fittings. Outdoor unit shall contain sufficient R-410a to charge complete system. The condenser shall be equipped with an inverter-driven compressor and external brass service valves and charging port. Indoor unit shall be equipped with electric resistance back-up heater (where indicated.) The outdoor condenser shall have a capillary tube metering device located internally. Evaporator and condenser coils shall be constructed with aluminum fins mechanically bonded to copper tubes. The system shall bear the AHRI Certification symbol.

B. Indoor unit shall be mounted as indicated on the Drawings. Controls shall be integral type IC thermostat with settings for multiple speeds and automatic position, 12-hour timer with ON/OFF settings, night set-back and energy saver position. Furnish hard-wired remote-control panel. Cooling and heating capacities and electrical characteristics shall be as shown on the Drawings. Supplemental electric resistance heat shall be provided where indicated.

C. Provide disconnect device for indoor unit when power is supplied by outdoor unit. Furnish low ambient controls and condenser coil guards unless indicated otherwise.

D. Where indicated on the drawings, provide condensate drainage pump with reservoir mounted below wall-hung indoor cassette units. Pump shall be mounted in a factory-made reservoir enclosure and shall be powered from the indoor unit circuit. Pump shall be self-priming. Pump shall be equivalent to the Blue Diamond Microblue with fascia kit, Rector seal Mini White, or Aspen Mini Blanc with opaque reservoirs.

2.3 REFRIGERANT PIPE SIZE

A. Pipe sizes shown on the drawings are for estimating purposes only. Final pipe sizes shall be selected by the manufacturer and shall be included in the submittal data. Accessories (larger crankcase heaters, liquid line solenoid valve, oversize suction accumulators, wind baffles, etc.) required or recommended by the equipment manufacturer shall be provided at no additional cost.

2.4 EMERGENCY DRAIN PAN

A. Furnish float switch in the emergency drain pan which de-energize the associated HVAC system when moisture is present.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine installation locations for compliance with requirements for conditions affecting installation and performance of units. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units according to manufacturer's written instructions.

B. Furnish float switch for unit shutdown interlock.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping to allow service and maintenance.

B. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. Furnish flexible connections at all unit connections.

C. Electrical: Conform to applicable requirements in Division 26 Sections.

D. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 COMMISSIONING

A. Verify that installation is as indicated and specified.

B. Complete manufacturer's installation and startup checks and perform the following:

1. Level unit on support structure.

2. Inspect for visible damage to unit casing.

3. Inspect for visible damage to compressor, air-cooled condenser coil, and fans.

4. Verify that clearances have been provided for servicing.

5. Check that labels are clearly visible.

6. Verify that controls are connected and operable.

7. Remove shipping bolts, blocks, and tie-down straps.

8. Verify that filters are installed.

9. Adjust vibration isolators.

10. Check acoustic insulation.

C. Lubricate bearings on fan.

D. Check fan-wheel rotation for correct direction without vibration and binding.

E. Adjust fan belts to proper alignment and tension.

F. Start unit according to manufacturer's written instructions.

1. Perform starting of refrigeration in summer only.

2. Complete startup sheets and attach copy with Contractor's startup report.

G. Check and record performance of interlocks and protection devices; verify sequences.

H. Operate unit for an initial period as recommended or required by manufacturer.

I. Calibrate thermostats.

J. Check internal isolators.

K. Check controls for correct sequencing of heating, refrigeration, and normal and emergency shutdown.

L. Simulate maximum cooling demand and check the following:

1. Compressor refrigerant suction and hot-gas pressures.

2. Short circuiting air through condenser or from condenser to outside-air intake.

M. After starting and performance testing, change filters, vacuum heat exchanger and cooling and condenser coils, lubricate bearings and adjust belt tension.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

2. Review data in the maintenance manuals.

3. Schedule training with Owner through the Design Professional, with at least 7 days' advance notice.

4. Provide letter from factory service representative stating that equipment is installed and operating as per manufacturer’s recommendations.

END OF SECTION 238126

SECTION 238127
VARIABLE REFRIGERANT FLOW HEAT PUMP SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes variable refrigerant flow (VRF) heat pump systems and related components. Systems are capable of providing simultaneous heating and cooling in adjacent zones on a single VRF system (heat recovery type.)

B. Related Sections include the following:

1. Division 23 Sections for manufactured isolation bases.

2. Division 23 Sections for temperature-control devices, and control wiring.

1.3 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities of selected model clearly indicated; dimensions; required clearances; shipping, installed, and operating weights; furnished specialties; accessories; and installation and startup instructions.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

2. Refrigerant piping schematics showing sizes and accessories.

3. Manufacturer’s certified engineering design conforming to the contract documents.

C. Commissioning Reports: Indicate results of startup and testing commissioning requirements. Submit copies of checklists including printed data logs indicating pressure and vacuum tests performed on each system. Commissioning shall be performed and/or supervised by a factory authorized agent and not the installing contractor.

D. Maintenance Data: For equipment to include in the maintenance manuals.

E. Warranties: Special warranties specified in this Section.

F. System Design File: Submit final electronic design file to engineer after systems have been fully installed and startup is complete. File shall be in the manufacturer’s standard format and shall include equipment model numbers, control components, and final pipe sizes, lengths, and fitting quantities.

1.4 QUALITY ASSURANCE

A. Fabricate, label and install refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration;" ASHRAE 34, “Domestic and Safety Classification of Refrigerants;” and, applicable building codes.

B. Energy Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

C. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Performance shall be certified by AHRI in accordance with Standard 1230: Variable Refrigerant Flow Multi-Split Air Conditioners and Heat Pumps.

E. Listing and Labeling: Provide electrically operated components specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

2. The units shall be listed by electrical laboratories (ETL) and bear ETL label.

F. Comply with NFPA 70.

G. Project specific engineered system design shall be performed by an agent authorized by the manufacturer.

H. Refer to specification section “General HVAC Provisions” for installing contractor qualifications. Installing contractor shall be certified by the equipment manufacturer/supplier.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver indoor and outdoor units as factory-assembled units with protective crating and covering.

B. Coordinate delivery of units in sufficient time to allow movement into building.

C. Handle units to comply with manufacturer's written rigging and installation instructions for unloading and moving to final location.

1.6 COORDINATION

A. Coordinate installation of equipment supports

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: A written warranty, executed by the manufacturer and signed by the Contractor, agreeing to replace components that fail in materials or workmanship, within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.

1. Warranty Period, Compressors and System Components: Not less than 10 years after date of material completion for all parts.

C. The System shall be installed by Manufacturer's factory certified and trained dealer.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Filters: Two sets of washable filters for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. VRF Systems:

a. Carrier
b. Daikin
c. Mitsubishi
d. Samsung
e. LG
f. York

2. Two-pipe or three-pipe systems are acceptable.

2.2 OUTDOOR UNIT

A. General: Outdoor unit shall be designed and configured for use specifically with other VRF components included in the system. The outdoor units shall be equipped with multiple circuit boards that interface to the central VRF controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.

1. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor.

2. Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 63 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 53 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.

3. All refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated.

4. Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.

5. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.

6. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.

7. The outdoor unit shall have the ability to operate with a maximum height difference and have total refrigerant tubing length indicated on the drawings.

8. The outdoor unit shall be capable of operating in heating mode down to -4°F ambient temperature or cooling mode down to 23°F ambient temperature, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.

9. The outdoor unit shall not cease operation in any mode based solely on outdoor ambient temperature.

10. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

B. Unit Cabinet: The casing(s) shall be fabricated of galvanized steel, bonderized and finished.

1. Units cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models.

C. Fan:

1. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.

2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.

4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The outdoor unit shall have vertical discharge airflow unless indicated otherwise on the drawings.

D. Refrigerant: R410A refrigerant shall be required for outdoor unit systems.

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The coil fins shall have a factory applied corrosion resistant blue-fin finish.

3. The coil shall be protected with an integral metal guard.

4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.

5. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.

F. Compressor:

1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non-inverter-driven compressors are not acceptable.

2. A crankcase heater(s) shall be factory mounted on the compressor(s).

3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-8% of rated capacity, depending upon unit size.

4. The compressor will be equipped with an internal thermal overload.

5. The compressor shall be mounted to avoid the transmission of vibration.

G. Electrical:

1. The outdoor unit shall be controlled by integral microprocessors.

2. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

2.3 BRANCH CIRCUIT (BC) CONTROLLERS (OR HEAT RECOVERY UNITS)

A. General: The BC (Branch Circuit) Controllers shall be designed for use with the other VRF system components. These units shall be equipped with a circuit board that interfaces to the VRF controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The BC Controller shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. The sum of connected capacity of all indoor air handlers shall range from 50% to 120% of rated capacity.

B. BC Unit Cabinet:

1. The casing shall be fabricated of galvanized steel.

2. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.

3. The unit shall house two tube-in-tube heat exchangers.

C. Refrigerant: R410A refrigerant shall be required.

D. Refrigerant valves:

1. The unit shall be configured to support branching arrangements and capacities indicated on the drawings.

2. Each branch shall have multiple two-position valves to control refrigerant flow.

3. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without interruption to overall system operation. Each service valve shall have an access port on the indoor units side of the valve. Service valve assemblies shall be completely insulated to prevent condensation.

4. Linear electronic expansion valves shall be used to control the variable refrigerant flow.

E. Integral Drain Pan: An integral insulated condensate pan and drain shall be provided.

F. Electrical:

1. The BC Controller shall be controlled by integral microprocessors.

2. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

2.4 STANDARD 4-WAY CEILING-RECESSED CASSETTE WITH GRILLE (INDOOR UNIT)

A. General: The unit shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function, a test run switch, and the ability to adjust airflow patterns for different ceiling heights. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. Unit Cabinet:

1. The cabinet shall be space-saving ceiling-recessed cassette.

2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

3. Cabinet shall have an outlet to serve branch supply ductwork.

4. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

5. The grille vane angles shall be individually adjustable from the wired remote controller to customize the airflow pattern for the conditioned space

C. Fan:

1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

3. The indoor fan shall consist of five (5) speed settings, Low, Mid1, Mid2, High and Auto.

4. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.

5. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.

6. The indoor unit shall have switches that can be set to provide optimum airflow based on ceiling height and number of outlets used.

7. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.

8. The vanes shall have an Auto-Wave selectable option in the heating mode that shall randomly cycle the vanes up and down to evenly heat the space.

9. If specified, the grille shall have an optional i-see sensor that will measure room temperature variations and adjust the airflow accordingly to evenly condition the space.

D. Filter: Return air shall be filtered by means of a long-life washable filter.

E. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.

6. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 33 inches above the condensate pan.

7. Both refrigerant lines to the indoor units shall be insulated.

F. Controls: This unit shall use controls provided by manufacturer to perform functions necessary to operate the system.

2.5 COMPACT 4-WAY CEILING-RECESSED CASSETTE WITH GRILLE (INDOOR UNIT)

A. General: The unit shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. Unit Cabinet:

1. The cabinet shall be a compact 22-7/16” wide x 22-7/16” deep so it will fit within a standard 24” square suspended ceiling grid.

2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

3. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

C. Fan:

1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

3. The indoor fan shall consist of three (3) speeds, Low, Mid, and High.

4. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.

5. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.

D. Filter: Return air shall be filtered by means of a long-life washable filter.

E. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.

6. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4” inches above the condensate pan.

7. Both refrigerant lines to the indoor units shall be insulated.

F. Controls: This unit shall use controls provided by the Manufacturer to perform functions necessary to operate the system.

2.6 HIGH/MEDIUM STATIC CEILING-CONCEALED DUCTED INDOOR UNIT

A. General: The unit shall be a ceiling concealed ducted indoor fan coil that mounts above the ceiling with a fixed rear return and a horizontal discharge supply, and shall have a modulating linear expansion device. High static models shall feature external static pressure settings up 0.80 in. WG. Units shall have the ability to control supplemental heat via a 12 VDC output.

B. Indoor Unit. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:

1. The cabinet shall be ceiling-concealed, ducted.

2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

D. Fan:

1. The indoor unit fan shall be an assembly with one or two Sirocco fan(s) direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

3. The indoor unit shall have a ducted air outlet system and ducted return air system.

E. Filter:

1. Return air shall be filtered by a field-supplied filter.

2. Optional rear return filter box with long-life filter shall available for all high static ceiling-concealed ducted indoor units.

F. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan, drain, and float switch shall be provided under the coil.

6. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 21-inches above the condensate pan.

7. Both refrigerant lines to the indoor units shall be insulated.

G. Controls: This unit shall use controls provided by the Manufacturer to perform functions necessary to operate the system. Please refer to Part 3 of this guide specification for details on controllers and other control options.

PART 3 – CONTROLS

3.1 OVERVIEW

A. General: The VRF system controls network shall be capable of supporting remote controllers, schedule timers, system controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems via BACnet® and LonWorks®.

3.2 ELECTRICAL CHARACTERISTICS

A. General: The control network shall operate at 24 VDC. Controller power and communications shall be via a common non-polar communications bus.

B. Wiring type:

1. Wiring shall be 2-conductor (16 AWG), twisted shielded pair, stranded wire, as defined by the system manufacturer.

2. Network wiring shall be CAT-5e with RJ-45 connection.

3.3 VRF SYSTEM CONTROLS NETWORK

A. The VRF system controls network consists of remote controllers, schedule timers, system controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The controls network shall support operation monitoring, scheduling, error email distribution, personal browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using BACnet® interface.

3.4 REMOTE CONTROLLERS

A. Remote-Controller:

1. Thermostat Interface: Each indoor heat pump shall have a thermostat interface device that allows a networked thermostat as specified in section 230900 to operate the heat pump unit.

2. The remote controller shall be capable of controlling up to 16 indoor units (defined as 1 group). The remote controller shall be approximately 5” x 5” in size and white in color with a light-green LCD display. The remote controller hall support a selection from multiple languages (Spanish, German, Japanese, Chinese, English, Russian, Italian, or French) for display information. The remote controller supports temperature display selection of Fahrenheit or Celsius. The remote controller shall control the following grouped operations: On/Off, Operation Mode (cool, heat, auto, dry, and fan), temperature set point, fan speed setting, and airflow direction setting. The remote controller shall support timer settings of on/off/temperature up to 8 times in a day in 1-minute increments. The remote controller shall support an Auto Off timer. The remote controller shall be able to limit the set temperature range from the controller. The room temperature shall be sensed at either the remote controller or the indoor unit dependent on the indoor unit dipswitch setting (default shall be to sense at the remote wall-mounted controller). The remote controller shall display a four-digit error code in the event of system abnormality/error.

3. The remote controller shall require no addressing. The remote controller shall connect using two-wire, stranded, non-polar control wire to the connection terminal on the indoor unit.

B. Centralized Controller: The centralized controller shall be capable of controlling via a PC a maximum of 50 indoor units across multiple outdoor units. A field supplied PC shall be required for the centralized controller. The centralized controller shall be approximately 5”x11” in size and shall be powered from a Power Supply Unit. The centralized controller shall support operation superseding that of the remote controllers, system configuration, daily/weekly/annual scheduling, monitoring of operation status, error email notification, online maintenance tool and malfunction monitoring. The centralized controller shall have basic

operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic control set of operation controls for the centralized controller shall include on/off, operation mode selection (cool, heat, auto, dry, and fan), temperature setting, fan speed setting, airflow direction setting, error email notification, and online maintenance. Since the centralized controller provides centralized control it shall be able to enable or disable operation of local remote controllers via the PC. In terms of scheduling, the centralized controller shall allow the user to define daily, weekly, and annual schedules with operations consisting of ON/OFF, mode selection, temperature setting, and permit/prohibit of remote controllers.

1. Standard software functions shall allow the building manager to securely log into each centralized controller via the PC's web browser to support operation monitoring, scheduling, error email, and online maintenance diagnostics. Standard software functions shall not expire. Additional optional software functions shall be provided for personal browser for PCs and MACs and for Tenant Billing. BACnet® interface shall be available through software operating on a dedicated PC.

3.5 WEB-BASED USER INTERFACE

A. Licenses per function, per centralized controller shall be required. All PCs shall be field supplied.

1. PC-Monitoring: The control network shall be capable of monitoring and operating all indoor units from a networked PC's web browser for up to 50 units per centralized controller.

2. PC Scheduling: The control network shall be capable of creating customized daily, weekly, and annual schedules from a network PC's web browser for up to 50 units per centralized controller. Schedules shall be applied to a single indoor unit, a group of indoor units, or collectively (batch) to all indoor units controlled by the centralized controller.

3. Online Error Email: The controls network shall be capable of sending detailed alerts to customizable distribution lists based on user defined error types.

4. Personal Web Browser: The controls network shall be capable of allowing up to 50 individual users to monitor and control user defined zones via a network PC or MAC's web browser.

5. Online Maintenance Diagnostics : The controls network shall be capable of performing maintenance diagnostics via a network PC and centralized controller using furnished software.

3.6 SERVICE TOOL

A. All software and connection hardware necessary to connect to Owner's computers directly to the VRF system network and perform diagnostics and maintenance shall be furnished to the Owner prior to maintenance training.

3.7 POWER SUPPLY

A. The power supply shall supply 24VDC for the centralized controller and for the central control transmission.

PART 4 - EXECUTION

4.1 EXAMINATION

A. Examine installation locations for compliance with requirements for conditions affecting installation and performance of units. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Pre-ceiling Examination: A periodic examination shall be conducted by the Manufacturer's certified startup representative after the units and piping associated with the system have been fully installed but before the ceilings have been installed. Multiple examinations may be required to assist with construction sequencing.

4.2 INSTALLATION

A. Install units according to manufacturer's written instructions.

B. Install units level and plumb, maintaining manufacturer's recommended clearances.

C. Equipment and appliances containing evaporators or cooling coils shall be installed with a means of condensate removal in compliance with IMC 307.2. A water level detection device conforming to UL 508 shall be provided for all main condensate pans and be interlocked to de-energize the unit's main fan should the drain pan water level exceed the main drain pipe connection level. Additional measures shall be taken where indicated on drawings or specifications.

4.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping to allow service and maintenance.

2. All flare fittings shall be appropriate for the refrigerant application. Flare nuts shall be tightened to the torque specifications indicated by the manufacturer.

B. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. Furnish flexible connections at all unit connections.

C. Network Integration: Coordinate with the Owner's IT department to facilitate integration of the VRF system controllers into the Owner's data network.

D. Electrical: Conform to applicable requirements in specification Sections.

E. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

4.4 COMMISSIONING

A. Verify that installation is as indicated and specified. Furnish manufacturer's system commissioning report with warranty number.

B. Complete manufacturer's installation and startup checks and perform the following:

1. Level unit on support structure.
2. Inspect for visible damage to unit casing.
3. Inspect for visible damage to compressor, air-cooled condenser coil, and fans.
4. Verify that clearances have been provided for servicing.
5. Check that labels are clearly visible.
6. Verify that controls are connected and operable.
7. Remove shipping bolts, blocks, and tie-down straps.
8. Verify that filters are installed.
9. Adjust vibration isolators.
10. Check acoustic insulation.

C. Lubricate bearings on fan.

D. Check fan-wheel rotation for correct direction without vibration and binding.

E. Adjust fan belts to proper alignment and tension.

F. Start unit according to manufacturer's written instructions.

1. Perform starting of refrigeration in summer only.
2. Complete startup sheets and attach copy with Contractor's startup report.

G. Check and record performance of interlocks and protection devices; verify sequences.

H. Operate unit for an initial period as recommended or required by manufacturer.

I. Calibrate thermostats.

J. Check internal isolators.

K. Check controls for correct sequencing of heating, refrigeration, and normal and emergency shutdown.

L. Simulate maximum cooling demand and check the following:

1. Compressor refrigerant suction and hot-gas pressures.
2. Short circuiting air through condenser or from condenser to outside-air intake.

M. After starting and performance testing, change filters, vacuum heat exchanger and cooling and condenser coils, lubricate bearings and adjust belt tension.

4.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

2. Review data in the maintenance manuals.

3. Schedule training with Owner through the Design Professional, with at least 7 days' advance notice.

4. Provide letter from factory service representative stating that equipment is installed and operating as per manufacturer’s recommendations.

END OF SECTION 238127

SECTION 238239
UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes unit heaters and cabinet unit heaters.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product data for each type of product specified.

C. Wiring diagrams detailing power and control wiring and differentiating clearly between manufacturer-installed wiring and field-installed wiring.

D. Samples of cabinet finish colors for approval.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Design Professionals and owners, and other information specified.

F. Field test reports from a qualified independent inspecting and testing agency indicating and interpreting test results relative to compliance with performance requirements of unit heaters.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in manufacturing unit heaters similar to those indicated for this Project and that have a record of successful in-service performance.

B. Comply with NFPA 70 for components and installation.

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

1.5 EXTRA MATERIALS

A. Furnish the following extra materials, matching products installed, packaged with protective covering for storage and with identification labels clearly describing contents.

B. Cabinet Unit Heater Filters: Furnish three spare filters for each filter installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide unit heaters by one of the following:

1. Brasch Manufacturing Co., Inc.
2. Carrier Corp.
3. Lennox Industries Inc.
4. Markel Products Company.
5. Marley Electric Heating Company; Berko Division.
6. Sterling Radiator Division/Mestek, Inc.
7. Trane Co.
8. Marley Electric Heating Company; Q-Mark Division.
9. Indeeco
10. Raywall

2.2 ELECTRICAL UNIT HEATERS

A. Heating Elements: Nickel-chromium heating wire element; free from expansion noise and 60-Hz hum; embedded in magnesium oxide, insulating refractory; and sealed in high-mass steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends are enclosed in terminal box. Fin surface temperature does not exceed 550 deg F at any point during normal operation.

B. Heater Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for overtemperature protection of heaters.

C. Fan and Motor: Direct-drive propeller fan and manufacturer's standard motor. Motors sized 1 hp and less include motor overload protection.

D. Wiring Terminations: Match conductor materials and sizes indicated.

E. Discharge Configuration: Horizontal discharge with horizontal, adjustable louvers.

F. Optional Accessories: Include the following:

1. Wall thermostat.

2. Safety-switch disconnect on cover of terminal box.

3. Magnetic contactors.

4. Fan-delay relay.

2.3 ELECTRIC WALL HEATERS

A. Heating Elements: Nickel-chromium heating wire element; free from expansion noise and 60-Hz hum; embedded in magnesium oxide, insulating refractory. Element ends are enclosed in terminal box.

B. Heater Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for overtemperature protection of heaters.

C. Fan and Motor: Direct-drive propeller fan and manufacturer's standard motor. Motors sized 1 hp and less include motor overload protection.

D. Wiring Terminations: Match conductor materials and sizes indicated.

E. Discharge Configuration: Horizontal discharge with horizontal, bar louvers.

F. Optional Accessories: Include the following:

1. Integral thermostat with exposed knob.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and supports to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of units. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install unit heaters as indicated, according to manufacturer's written instructions and NFPA 90A.

B. Connect unit heaters and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

3.3 FIELD QUALITY CONTROL

A. Testing: After installing unit heaters and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

B. Remove and replace malfunctioning units with new units and retest.

3.4 CLEANING

A. Replace filters in each cabinet unit heater.

END OF SECTION 238239

SECTION 260000

GENERAL

1.01 CONTRACT DOCUMENTS:

A. All work of Section 26 shall comply with the requirements of:

1. General Conditions
2. Supplementary General Conditions
3. General Requirements
4. Specifications
5. Drawings
6. Modifications incorporated in the documents before their execution.

1.02 WORK INCLUDED

A. This Division of the specifications (260000) covers the complete interior and exterior electrical system for all work shown on the drawings as specified herein providing all material, labor and equipment required for the installation of the electrical systems complete and in operating condition.

B. Include in the electrical work all the necessary supervision and the issuing of all coordinating information to any other trades who are supplying work to accommodate the electrical installations.

1.03 DRAWINGS

A. The drawings for electrical work utilize symbols and schematic diagrams which have no dimensional significance. The work shall therefore, be installed to fulfill the diagrammatic intent expressed on the electrical drawings.

B. Review architectural drawings for door swings, cabinets, counters, moldings and built-in equipment, conditions indicated on architectural drawings shall govern. Prior to rough-in of receptacles and systems outlets, refer to architectural casework drawings for rough-in coordination.

C. Coordinate electrical work with the architectural details, floor plans, elevations, structural and mechanical drawings. Provide fittings, junction boxes and accessories to meet conditions.

D. Do not scale drawings. Dimensions for layout of equipment, or spaces shall be obtained from architectural, structural or mechanical drawings unless specifically indicated on the electrical drawings.

E. Discrepancies shown on different drawings, between drawings and specifications or between drawings and field conditions shall be promptly brought to the attention of the Architect.

F. Provide as used on the drawings and in the specifications shall mean, furnish, install, connect, adjust and test.

G. The drawings and specifications are complimentary and any work or material shown in one and omitted in the other, or described in the one and not shown in the other, or which may be implied by both or either, shall be furnished as though shown on both, in order to give a complete and first class installation.

1.04 SITE INVESTIGATION

A. Potential Contractors shall visit the project site prior to bid date to satisfy themselves as to the existing conditions and distances which may effect the cost of the project. Where work under this project requires extension, relocation, re-connecting or modifications to existing equipment or systems, the existing equipment or systems, shall be restored to their original condition, with the exception of the work under this contract, before the completion of this project.

1.05 SHOP DRAWINGS

A. Submit for approval by the Architect all materials and equipment to be incorporated in the electrical work.

B. Submit only shop drawings which comply with the contract documents. Shop drawings shall be checked and corrected by the Contractor before they are submitted to the Architect. Shop drawings that are not corrected by the Contractor shall be returned for correction without detailed notations by the Architect as to the necessary corrections.

C. Mark each individual submittal item to show specification section which pertains to the item.

D. Submit information as required under SUBMITTALS, for each of the individual electrical sections of the specifications.

E. Data submitted shall contain all information required to indicate compliance with equipment specified.

F. Submit field information drawings to explain fully all procedures involved in erecting, mounting and connecting all items of equipment which differ from that specified.

G. When Shop Drawings are reviewed, some errors may be detected but others may be overlooked. This does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings, the requirements of the Drawings and Specifications shall be followed and are not waived or superseded in any way by the Shop Drawing review.

1.06 RECORD DRAWINGS:

A. One complete set of electrical drawings shall be reserved for as-built drawings. Any approved deviation from the contract drawings shall be recorded on these drawings. Drawings shall be checked monthly for completeness.

B. Completed as-built drawings shall be presented to the Architect prior to final inspection.

1.07 MAINTENANCE AND OPERATING INSTRUCTIONS:

A. Provide at the time of final inspection three sets of maintenance and operating instruction for:

1. Main Service Switchboard
2. Lighting and Power Panelboards

3. Fuses
4. Floor Boxes
5. Wiring Devices
6. Lighting Fixtures
7. Occupancy Sensors
8. Disconnect Switches
9. Fire Alarm System
10. Surge Protection System
11. Engine Generator Set
12. Data/Voice Networking & Cabling System

B. Furnish a qualified and accredited factory trained technician to train personnel designated by the Owner in the proper operation and maintenance of specialized equipment.

C. The issuing of operating instructions shall include the submission of the name, address, and telephone number of the manufacturer's representative and service company for each item of equipment so that service and spare parts can be readily obtained.

1.08 CODES AND PERMITS:

A. All electrical work shall meet or exceed the latest requirements of the following codes and/or other authorities exercising jurisdiction over the electrical construction work and the project.

1. The National Electrical Code (NFPA 70) - 2020 Edition
2. The National Electrical Safety Code (ANSI C-2)
3. The Life Safety Code (NFPA 101) - 2018 Edition
4. The International Building Code - 2018 Edition
5. Regulations of the local utility company with respect to metering and service entrance.
6. Municipal and State ordinances governing electrical work.

B. All required permits and inspection certificates shall be obtained, and made available at the completion of the work. Permits, inspections, and certification fees shall be paid for as a part of the electrical work.

1.09 DEVIATIONS:

A. No deviations from the plans and specifications shall be made without the full knowledge and consent of the Architect or his authorized representative.

B. Should the Contractor find at any time during progress of the work that, in his judgment, existing conditions make desirable a modification in requirements covering any particular item or items, he shall report such items promptly to the Architect for his decision and instruction.

1.10 COOPERATION:

A. This Contractor shall schedule his work and in every way possible cooperate with all other Contractors on the job to avoid delays, interferences, and unnecessary work. He shall notify them of all openings, hangers, excavations, etc., so that proper provisions shall be made for his work. This shall not relieve him of the cost of cutting, when such is required.

B. This Contractor shall do all cutting and excavating necessary for the complete installation of his work, but he shall not cut the work of any other Contractor without first consulting the Architect. He shall repair any work damaged by him or his workmen, employing the services of the Contractor whose work is damaged. Saw cut existing slab as required for routing conduits and floor boxes noted to be installed in existing floors. Restore to original finish.

C. This Contractor shall by all means coordinate the location of ceiling lighting fixtures, both recessed and surface mounted, with the Ceiling Contractor so that proper hangers and supports shall be provided.

D. Any conflict between electrical and other trades shall be reported before construction starts. No extra charges will be approved for work resulting from failure to coordinate with other trades.

E. Contractor shall provide all conduit, outlet boxes and 120 volt power for equipment provided and installed by Division 27 Contractor. Coordinate with Division 27 Contractor exact location of equipment, devices and 120 volt power requirements prior to rough-in.

1.11 INSTALLATION:

A. Raceways, fixtures, devices, and other electrical equipment shall be installed in a neat and workmanlike manner and in accordance with recognized good practice for a first class installation.

B. The Architect or his representative shall have the authority to reject any workmanship not complying with the contract documents.

C. The Electrical Contractor shall personally or through an authorized licensed and competent electrician, constantly supervise the work from beginning to complete and final inspection.

D. Electrical equipment shall be installed in accordance with manufacturer's recommendations.

E. Locations of proposed raceway, riser, location of structural elements, location and size of chases method and type of construction of floors, walls, partitions, etc., shall be verified before construction starts.

F. Consult owner and utility companies for underground lines before any underground work is started. Contractors shall be responsible for any damage.

G. All empty conduits shall have a pull string installed. All flush recessed boxes shall have black plates installed.

1.12 EXCAVATION, TRENCHING AND BACKFILLING:

A. General. The Contractor shall perform all excavation to install conduit structures and equipment specified in this Division of the Specifications. During excavation, materials for backfilling shall be piled back from the banks of the trench to avoid over-loading and to prevent slides and cave-ins. All excavated materials not to be used for backfill shall be removed and disposed of by the Contractor. Grading shall be done to prevent surface water from flowing into trenches and other excavations and water accumulating therein shall be removed by pumping. All excavations shall be made by open cut. No tunneling shall be done. All requirements of OSHA shall be complied with.

B. Trench Excavation. The bottom of the trenches shall be graded to provide uniform bearing and support for each section of the conduit on undisturbed soil at every point along its entire length. Over depths shall be backfilled with loose, granular, moist earth, tamped. Removed unstable soil that is not capable of supporting the conduit and replace with specified material.

C. Backfilling. The trenches shall not be backfilled until it is reviewed by the Architect or his representative. The trenches shall be backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, and gravel or soft shale, free from large clods of earth or stones, deposited in 6" layers and tamped until the conduit has a cover of not less than the adjacent existing ground but not greater than 2" above existing ground. The backfilling shall be carried on simultaneously on both sides of the trench so that conduit is not displaced. The compaction of the filled trench shall be at least equal to that of the surrounding undisturbed material, except that trenches occurring under paved areas or in areas to be filled shall be backfilled in 6" maximum layers and each layer compacted to 95% maximum density. Settling the backfill with water will not be permitted. Any trenches not meeting compaction requirements or where settlement occurs shall have backfill removed down to the top of the conduit then backfill with approved materials as specified hereinbefore.

D. Positively no tree roots are to be damaged, hand dig where required. Damaged trees or shrubbery shall be replaced in kind and must be approved by Engineer.

1.13 MATERIALS:

A. Materials specified by manufacturer's name shall be used unless approval of other manufacturers are listed in addenda to these specifications. Request for prior approval shall be submitted by mail only. Facsimile will not be acceptable.

B. Drawings indicating proposed layout of space, all equipment to be installed therein and clearance between equipment shall be submitted, where substitution of materials alter space requirements on the drawings.

C. Material Standards: All materials shall be new and shall conform to the standards where such have been established for the particular material in question. Publications and Standards of the organization listed below are applicable to materials specified herein.

1. American Society for Testing and Materials (ASTM)
2. Underwriter's Laboratories, Inc. (UL)
3. National Electrical Manufacturer Association (NEMA)
4. Insulated Cable Engineers Association (ICEA)
5. Institute of Electrical and Electronic Engineers (IEEE)
6. National Fire Protection Association (NFPA)
7. American National Standards Institute (ANSI)

D. Material of the same type shall be the product of one manufacturer.

E. Materials not readily available from local sources shall be ordered immediately upon approval.

F. The Architect shall have authority to reject any materials, or equipment, not complying with these specifications and have the Contractor replace materials so rejected immediately upon notification of rejection.

G. Any material or equipment so rejected shall be removed from the job within 24 hours of such rejection, otherwise the Architect may have same removed at the Contractor's expense.

1.14 EQUIPMENT CONNECTIONS:

A. All equipment requiring electrical power connections shall be connected under this Division of these specifications.

B. Where electrical connections to equipment require specific locations, such locations shall be obtained from shop drawings.

C. Drawings for location of conduit stub-up boxes mounted in wall or floor to serve specific equipment, shall not be scaled.

D. Electrical circuits to equipment furnished under other sections of these specifications are based on design loads. If actual equipment furnished has loads other than design loads electrical circuits and protective devices shall be revised to be compatible with equipment furnished at no additional cost to the Owner. Any revisions must have prior approval by the Architect. Before submitting shop drawings, Electrical Sub-Contractor shall along with the Mechanical and Plumbing Sub-Contractor review voltage and load requirements for mechanical and plumbing equipment to determine the compatibility between what is being furnished and what is shown in the contract drawings. The Electrical Sub-Contractor shall along with his submittals submit a statement that he has reviewed all shop drawings including review with the Mechanical and Plumbing Sub-Contractors.

E. Where equipment is indicated to be served thru conduit stub-up, conduit shall be stubbed up not less than four inches above floor where transition shall be made to sealtite flexible conduit for connection to equipment.

F. The Contractor's attention is invited to other Divisions of these specifications, where equipment requiring electrical service or electrically related work is specified to become fully aware of the scope of work required for electrical service or related work.

G. Where electricity utilizing equipment is supplied separate from the electrical work, and is energized, controlled or otherwise made operative by electrical work, the testing to provide the proper functional performance of such wiring systems shall be conducted by the trade responsible for the equipment. The electrical work shall, however, include cooperation in such testing and the making available of any necessary testing or adjustments to the electrical equipment.

H. Heating, air conditioning, and ventilating equipment is specified to be furnished and installed under other sections of these specifications. The controls, likewise are specified to be furnished thereunder. All necessary wiring, wiring troughs and circuit breakers for power for this equipment shall be furnished and installed under this section of the specifications, in accordance with the plans and/or diagrams furnished with the equipment, or shown on these plans. Starters furnished by the Mechanical Contractor shall be installed under this Division of the specifications. Power wiring to auxiliary equipment on a piece of equipment remote from its main terminal box and interlocking of apparatus shall be accomplished under Heating Ventilating Equipment section of the specifications. Conduit and outlets for control wiring shall be furnished and installed under Division 15 of these specifications. Control conductors for mechanical equipment shall not be installed in same conduit with power conductors.

I. Contractor is to note that location of disconnect switches shown are schematic in nature. Exact location of disconnect switch and mounting height shall be coordinated with field conditions and equipment shop drawings. Locate disconnect as required to maintain clearances required by National Electrical Code.

J. Contractor shall provide a rooftop mounted, GFCI receptacle with weatherproof cover within 20' of a rooftop mounted HVAC unit. Serve from closest receptacle circuit with ½"C., 3#12's. See mechanical plan for unit locations.

1.15 PRODUCT DELIVERY, STORAGE, HANDLING, & PROTECTION

A. Inspect materials upon arrival at Project and verify conformance to Contract Documents. Prevent unloading of unsatisfactory material. Handle materials in accordance with manufacturer's applicable standards and suppliers recommendations, and in a manner to prevent damage to materials. Store packaged materials in original undamaged condition with manufacturer's labels and seals intact. Containers which are broken, opened, damaged, or watermarked are unacceptable and shall be removed from the premises.

B. All material, except items specifically designed to be installed outdoors such as pad mounted transformers or stand-by generators, shall be stored in an enclosed, dry building or trailer. Areas for general storage shall be provided by the Contractor. Provide temperature and/or humidity control where applicable. No material for interior installation, including conductors, shall be stored other than in an enclosed weather tight structure. Equipment stored other than as specified above shall be removed from the premises.

C. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Conditions shall be those for which the equipment or materials are designed to be installed. Equipment and materials shall be protected from water, direct sunlight, cold or heat. Equipment or materials damaged or which are subjected to these elements are unacceptable and shall be removed from the premises and replaced.

1.16 CLEANING AND PAINTING

A. Remove oil, dirt, grease and foreign materials from all raceways, fittings, boxes, panelboard trims and cabinets to provide a clean surface for painting. Touch-up scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, motor control center, switchboard or equipment enclosures with paint furnished by the equipment manufacturers specifically for that purpose.

B. Do not paint trim covers for flush mounted panelboards, telephone cabinets, pull boxes, junction boxes and control cabinet unless required by the Architect. Remove trim covers before painting. Under no conditions shall locks, latches or exposed trim clamps be painted.

C. Unless indicated on the drawings or specified herein to the contrary, all painting shall be done under the PAINTING Section of these Specifications.

D. Where plywood backboards are used to mount equipment provided under Division 26, paint backboards with two coats of light grey semi-gloss paint. Plywood shall be 3/4" fire rated plywood. Paint shall be fire retardant paint.

1.17 GUARANTEE:

A. All systems and component parts shall be guaranteed for two (2) years from the date of final acceptance of the complete project. Defects found during this guaranteed period shall be promptly corrected at no additional cost to the Owner.

1.18 SERVICE:

A. The electrical service and telephone service for this project has been coordinated between the Engineer and the Utility Company. However, before installing service conduit (underground or mast), Contractor shall contact Utility Company and verify voltage, location and type of service. Prior to rough-in, coordinate an on-site meeting with each Utility Company to review exact requirements. Submit letter of coordination to Engineer for review.

B. Where contract documents show a pad mount transformer provide by Utility Company, the following items shall be coordinated with Civil Plans, Architectural Plans, and Utility Company prior to rough-in.

1. Transformer pad locations shall be a minimum of 10'-0" from any building overhangs, canopies, exterior walls, balcony, exterior stairs and or walkways connected to the building.
2. Transformer pad edge shall be no less than 14'-0" from any door way.
3. Transformer pad edge shall be no less than 10'-0" from any windows or other openings.
4. If the building has an overhang, the 10'-0" clearance shall be measured from a point below the edge of the overhang only if the building is three (3) stories or less. If the building is four (4) stories or more, 10'-0" shall be measured from the outside building wall.
5. Fire escapes, outside stairs, and covered walkways attached to or between buildings, shall be considered part of the building.

Note: This information above has been obtained from the NFPA Section 450-27 and the Office of Insurance and Safety Fire Commissioner Chapter 120-3-3.

6. If required by Utility Company, Contractor shall provide concrete pad for transformer per Utility Company requirements.
7. Contractor shall install meter (provided by Utility Company) on a 6" channel iron set in concrete. Paint channel iron to match transformer. Install 1 ¼" galvanized rigid steel conduit from meter to transformer C.T. compartment.
8. Install a 1" galvanized rigid steel conduit from meter and stubbed up into Main Electrical Room for future energy management monitoring. Install pull string and cap conduit.

END OF SECTION

SECTION 260003

ELECTRICAL SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the preparation of Electrical Division 26 Shop Drawings, Product Data, Samples, and other submittals.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

B. All submittals shall be submitted in electronic format.

C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into indexed files incorporating submittal requirements of each single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner**,** containing the following information for EACH SECTION:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Construction Manager/General Contractor.
    e. Name of Electrical Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Names of subcontractor, manufacturer, and supplier.
    h. Specification Section number and title.
    i. Indication of full or partial submittal.

D. Options: Identify options requiring selection by Architect.

E. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

2.2 SUBMITTAL DATA

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. Mark each copy of each submittal to show which products and options are applicable.
2. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

3. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

4. Submit Product Data before or concurrent with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

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

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

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

3.2 ENGINEER’S ACTION

A. Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it.

B. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

C. Submittals not required by the Contract Documents may be returned by the Architect without action.

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END OF SECTION 26 0003

SECTION 260005

MAIN SERVICE SWITCHBOARD

1.01 SUBMITTALS

A. Submit complete drawing providing the following information: Complete rating, short-circuit with stand ability of bus and of lowest rated device, overall outline dimensions including space available for conduits, circuit schedule showing circuit numbers, device description, device frame ampere rating, trip of fuse clip ampere rating, feeder circuit identification, conductor ratings, and one line diagram with each circuit device numbered.

B. Manufacturer's published literature on each component part of the switchboard and of the switchboard as a complete unit.

C. Contractor utilizing switch gear other that Square "D" Company, shall submit layout of electrical rooms delineating placement of equipment.

1.02 MANUFACTURERS

A. For the purpose of selecting quality and type of switchboard, equipment as manufactured by Square "D" Company has been specified. Following manufacturers meeting these specifications are acceptable.

1. G.E.
2. Siemens
3. Cutler Hammer

1.03 EQUIPMENT

A. Furnish and install the factory assembled service entrance switchboard as herein specified and as shown on the drawings. The switchboard shall be Underwriters' Laboratories approved. The switchboard shall be equal to Square "D" power style, multi-section.

B. The switchboard shall be dead-front with front accessibility required. The switchboard framework shall consist of steel channels bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting. The framework is to be formed of code gauge steel rigidly welded together to support all cover plates, bussing and component devices.

C. Each switchboard section shall have an open bottom and individual removable top plate for installation and termination of conduit. Top and bottom conduit area is to be clearly shown and dimensioned on the shop drawings. The wireway front covers are to be hinged to permit access to the branch breaker load side terminals without removing the covers. All front plates used for mounting meters, selector switches or other front mounted devices shall be hinged with all wiring installed and laced with flexibility at the hinged side. All closure plates shall be screw removable and small enough for easy handling by one man. The paint finish shall be grey enamel over a rust-inhibiting phosphate primer.

D. The switchboard bussing shall be copper and of sufficient cross-sectional area to continuously conduct rated full load current with a maximum average temperature rise of 65 degrees C. above an ambient temperature of 40 degrees C.

The bus bars shall be rigidly braced to comply with the integrated equipment rating of the switchboard. Minimum 65,000 AIC sym.

The main horizontal bus bars between sections shall be located on the back of the switchboard to permit a maximum of available conduit area. The horizontal main bus bar supports, connections, and joints are to be bolted with grade 5 carriage bolts and Belleville washers to be free of periodic maintenance.

E. Each switchboard, as a complete unit, shall be given a single integrated equipment rating by the manufacturer. The integrated equipment short-circuit rating shall certify that all equipment is capable of withstanding the stresses of a fault equal to that of the least over current protective device contained therein. Such rating shall be established by actual tests by the manufacturer on similar equipment constructed as the subject switchboard. This test data shall be furnished to the Engineer, with the submittal of approval drawings.

F. The incoming section of the switchboard shall consist of a main circuit breaker sized as shown on the drawings.

1. A ground fault protection system shall be provided. The ground fault protection system shall include a current sensor and appropriate relaying equipment. The current sensor shall enclose all phase and neutral, conductors of the circuit to be monitored. The current sensor frame shall be so constructed that one leg can be opened to allow removal of sensor without disturbing the cables or requiring drop-links in the bussing. A test winding shall be provided to simulate the flow of ground fault current through the current sensor, in order to test the complete system, including sensor pickup, relaying equipment and electric trip mechanism of the switch. The ground fault relay shall be solid state construction and have adjustable pick-up for ground fault currents from 200 amperes to 1200 amperes. Time delay provided by the ground fault relay circuitry shall be nominally .3 second and shall be permanently calibrated to preclude tampering with after installation. The ground-fault protection system shall be performance tested when first installed on site. The test shall be conducted in accordance with instruction that shall be provided with the equipment. A written record of this test shall be delivered to the Engineer.

G. A group mounted section (or sections) containing molded case circuit breakers with trip ratings as shown on the drawings. Branch molded case circuit breakers shall be totally front accessible and front connectable. The breakers are to be mounted in the switchboard to permit installation, maintenance and testing without reaching over any line side bussing.

Each breaker is to be furnished with an externally operable mechanical means to trip the circuit breaker, enabling maintenance personnel to verify the ability of the breaker trip mechanism to operate as well as exercising the breaker latch and operating mechanisms. Each type of circuit breaker assembly shall have undergone and passed heat tests according to UL test procedures and the UL listed.

Provide minimum 65,000 AIC sym. rating for all circuit breakers.

END OF SECTION

SECTION 260010

LIGHTING AND POWER PANELBOARDS

1.01 SUBMITTALS

A. Complete panelboard shop drawings shall be submitted, listing as a minimum the following items:
   1. Voltage rating.
   2. Bus assembly rating.
   3. Main breaker rating by capacity, number of poles and interrupting rating in RMS symmetrical amperes.
   4. Surface or flush mounting.
   5. Listing of branch breakers by capacity number of poles and interrupting rating in RMS symmetrical amperes.
   6. Top or bottom feed.
   7. A schedule similar to that shown on the drawings, depicting branch breaker arrangement and breaker sizes and giving full explanation for any difference between the two.
   8. Coordinate lug sizes as required for feeders shown on drawings.

B. Contractor utilizing switch gear other than Square "D" Company, shall submit layout of electrical rooms delineating placement of equipment.

1.02 MANUFACTURERS

A. For the purpose of selecting quality and types of panels, equipment as manufactured by Square "D" Company has been specified. Following manufacturers meeting these specifications are acceptable.
   1. G. E.
   2. Siemens
   3. Cutler Hammer

1.03 EQUIPMENT

A. Furnish and install circuit breaker lighting and power panelboards as indicated in the panelboard schedule and where shown on the plans. Panelboards shall be of the dead-front safety type, equipped with thermal magnetic molded case circuit breakers with frame and trip rating as shown in the schedule.

B. Circuit breakers shall be HACR rated, quick-make, quick-break, thermal-magnetic, trip-indicating, and have common trip on all multi-pole breakers. Trip indication shall be clearly shown by the breaker handle taking position between ON and OFF, when the breaker is tripped. Branch circuit breakers feeding convenience outlets shall have sensitive instantaneous trip setting of not more than 10 times the trip rating of the breakers. Connection to bus in all panels shall be bolted. All breakers shall be 20 ampere trip, unless otherwise shown. All breakers shall be minimum for 120/208 volts 10,000 A.I.C. sym. And for 277/480 volts 14,000 A.I.C. unless otherwise noted.

C. Bus bar connections to the branch circuit breakers shall be the distributed phase type. Three-phase, four-wire bussing shall be such that any three adjacent single-pole breakers are individually connected to each of the three different phases in such a manner that two or three-pole breakers can be installed at any location. All current-carrying parts of the bus assembly shall be copper. Main ratings shall be as shown in the panelboard schedule on the drawings.

D. Panel front shall be door-in-door trim with a continuous piano hinge on outer cover. Cutler Hammer “EZ” trim is not acceptable.

E. A steel circuit directory frame permanently attached (spot welded) at factory (not glued), and card with a clear plastic covering shall be provided on the inside of the door. The directory card shall provide a space at least 1/4" high x 3" long for each circuit.

F. All panels shall be equipped with a copper equipment grounding bar. The bar shall have lugs of sufficient size to handle all grounding conductors.

G. Sub-feed circuit breakers are not permitted in panels unless specifically called for.

H. Provide mounting hardware for all spaces shown on panelboard schedule.

I. Panelboard circuit numbering shall be such that starting at the top, odd numbering shall be used in sequence down the left hand side and even numbers down the right hand side.

J. Except where otherwise indicated on the drawings or required to avoid conflicts, mount the panelboards so the tops of the cabinets will be 6 feet above the finished floors. For panelboards which are too high, mount them so the bottoms of the cabinets will be not less than 6 inches above the finished floors.

K. Locate the cabinets so that present and future conduits can be connected to them conveniently. Coordinate the dimensions of the cabinets with the dimensions of the spaces designated for installation prior to fabrication of the cabinets. Cabinet shall be minimum 20" wide.

L. Wiring in panelboards shall be neatly grouped and secured with ty-wraps.

M. Electrical panels shall not be used as wireways or junction boxes for control conductors.

N. Where spaces are called for in a panel, all mounting hardware shall be provided for the frame size indicated.

O. Splices in panelboards are not permitted.

END OF SECTION

SECTION 260015

FUSES

1.01 SUBMITTALS

A. Shop drawings shall be submitted and shall consist of manufacturer's published literature and technical data sufficient for the engineer to determine whether system function will be adversely affected, whether proposed fuses meet this specification, and whether they are equal in quality.

1.02 MANUFACTURERS

A. Acceptable manufacturers are:

1. Littelfuse
2. Cefco
3. Gould - Shawmut

1.03 EQUIPMENT/MATERIAL

A. All fuses rated 600 volts or less and used for main, feeder, or branch circuit protection with 200,000 ampere interrupting rating and shall be so labeled. Fuse classes and sizes indicated on the drawings have been selected to provide a fully coordinated selective protection system. To maintain this design, all fuses provided shall be furnished by the same manufacturer. Should equipment provided require a different U.L. Class or fuse size, the engineer shall be furnished with sufficient data to ascertain that system function will not be adversely affected.

B. Current-Limiting Fuses 600 Amperes or Less

All fuses 600 amperes and below shall be true dual-element time delay fuses with separate spring-loaded thermal overload elements in all ampere ratings. All ampere ratings shall be designed to open at 400 degrees Fahrenheit or less when subjected to a non-load oven test. To eliminate induction heating, all fuse ferrules and end caps shall be non-ferrous and shall be bronze or another alloy not subject to stress cracking.

C. Spare Fuses

At the time of final acceptance, the contractor shall furnish the owner's representative, not less than three (3) spare fuses of each size and type installed.

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END OF SECTION 26 0015

SECTION 260020

RACEWAYS

1.01 SUBMITTALS

A. Submit manufacturer's literature for each type of conduit or tubing and fittings used in the project.

1.02 MANUFACTURERS

A. Acceptable manufacturers of rigid steel and electrical metallic tubing conduit are:
1. Allied Tube and Conduit Co.
2. Wheatland Tube Co.
3. Triangle
4. L.T.V.
5. American Brass
6. E.T.P.
7. Robroy
8. PYTCO
9. RYMCO

B. Acceptable manufacturer's of polyvinyl chloride (PVC) conduit are:
1. Certainteed
2. Georgia Pipe
3. Carlon
4. Can-Tex
5. Queen City

C. Acceptable manufacturer’s of conduit fittings, bushings, and locknuts are:
1. O-Z/Gedney
2. Thomas and Belts
3. Raco

1.03 MATERIALS

A. All metallic conduit and electric metallic tubing shall be steel, of standard pipe dimensions, smooth inside and out, and shall be galvanized. Where the word "conduit" is used hereinafter it shall mean either rigid steel conduit, electric metallic tubing, flexible steel conduit, liquid tight flexible steel conduit or schedule 40 plastic conduit. Intermediate grade conduit is not acceptable.

B. Galvanized rigid steel conduit shall be used in all areas where it will be exposed to physical damage. Schedule 40 plastic conduit shall be used underground and in slab-on-grade. In no case shall plastic conduit be exposed; switch to rigid steel conduit when turning up exposed. All other conduit, unless otherwise specified or called for on the plans, may be galvanized electric metallic tubing. Any exposed conduit on exterior of the building shall be galvanized rigid steel only.

C. Plastic conduit shall be made from virgin polyvinyl chloride C-300 compound. Conduit and fittings shall carry a UL label. Fitting and cement shall be produced by the same manufacturer as the conduit to assure system integrity.

D. All conduit shall be concealed in building construction except as noted or shown otherwise. In areas with no finished ceiling and where conduit is run exposed all runs down to switches, receptacles, etc. shall when possible be concealed in wall. It is the intent of these specifications that all conduit will be concealed

whenever possible. Where outlets are required to be installed on existing walls in a finished space, raceway and outlet box shall be wiremold surface metal raceway.

E. EMT fittings shall be compression or and made of steel for sizes two inches or smaller, steel set screw type fittings may be used on sizes 2 1/2" or larger. Connectors and couplings shall be rain tight and shall have a nylon insulated throat. All fittings shall be "UL" approved. Die cast, and indenter type fittings are not acceptable. Fittings for flexible steel conduits and liquid tight flexible conduit shall be steel and have nylon insulated throat.

F. Rigid steel conduit and EMT shall be not less than ½ inch trade size, schedule 40 plastic conduit shall not be less than 3/4" trade size and not less than required by the NEC or indicated. Conduit runs with more than 5 #12 conductors shall not be less than 3/4".

G. Conduit and EMT systems indicated on the drawings for communication and signaling systems are for typical systems. Install conduit and EMT systems for the system being installed.

H. Connect individual recessed lighting fixtures to the conduit or EMT system with "maximum 6'-0" flexible, galvanized steel conduit. Use flexible galvanized, steel metal conduit for final connection to all rotating equipment and transformers. The flexible conduits shall be long enough to permit the full range of required movements without strain and to prevent the transmission of vibration. Do not utilize flexible conduit to loop between fixtures and devices.

I. Galvanized rigid steel conduit couplings and connections:
   1. Install standard, conduit-threaded fittings.
   2. Ream the ends of conduits after cutting and threading them.
   3. For connection to sheet metal boxes, cabinets and other sheet metal enclosures, install locknuts on the inside and outside of the enclosure for each connection. See Section 260110 of these specifications.

J. EMT couplings and connectors:
   1. Ream the ends of EMT after cutting them.
   2. Install the following threadless type fittings:

      a. Connectors: steel compression type with insulated throat or steel tap-on type with insulated throat.
      b. Couplings: steel compression or tap-on type.

K. Installation of plastic conduit:
   1. Shall be installed in complete accordance with manufacturer's recommendations.
   2. Shall be a minimum of 2'-0" below finished grade when not covered by concrete.
   3. Shall have properly sized bond wire installed with all circuits.
   4. Bends and turns shall be kept to a bare minimum.
   5. Extreme care shall be taken to avoid crushing or cracking conduit. "DO NOT" run vehicles over exposed conduit under any conditions.
   6. All conduit and fittings shall be solvent welded.
   7. Plastic conduit maybe turned up in masonry walls only. PVC conduit shall be allowed to be routed concealed in masonry walls to a maximum height of 48" A.F.F.

8. Do not install conduit in slab. All conduit shall be installed a minimum of 6" below slab. Conduits shall not be bunched together. Maintain 1" clearance between conduits.
9. Plastic conduit shall not be bent with a propane torch or open flame. Contractor shall utilize a heat gun, heat blanket, or hot box. Plastic conduit bent with such shall not be scorched or marred.

L. Insulated bushings:
1. Install nylon insulated bushings on the end of all rigid conduit.
2. The insulating material shall be designed for rugged, long service.
3. Bushings which consist of only insulating material will not be accepted.
4. Fittings which incorporate insulated bushings will be considered for approval in lieu of fittings with separate bushings.

M. All couplings and connections in location where water or other liquid or vapor might contact the conduit and EMT shall also be watertight.

N. Close empty conduit and EMT as complete runs before pulling in the cables and wires.

O. Install exposed conduit and EMT parallel to or at right angles with the lines of the building. Locate them so they will not obstruct headroom or walkways or cause tripping.

P. Avoid bends or offsets where practicable:
1. Do not install more bends, offsets or equivalent in any conduit or EMT run than permitted by the NEC.
2. Make bends with standard conduit bending machines.
3. Conduit hickeys may be used for making slight offsets and for straightening conduits stubbed out of concrete.
4. Conduit or EMT bent with a pipe tee or vise will not be accepted.
5. Do not install crushed or deformed conduits or EMT.

Q. Install conduit or EMT clamps:
1. At intervals as required by the NEC.
2. Above suspended ceilings, metal supports may be installed as permitted by the NEC, except that conduit cannot be supported or secured to the T-bar grid or from the wire supporting the T-bar grid.
3. Trapeze, split ring, band or clevis hanger may be installed as permitted by the NEC. Trapeze hangers shall be structural metal channels, angle irons or preformed metal channel shapes with the conduit and EMT runs held on specific center by U bolts, clips or clamps. Do not support conduit from ceiling suspension wire or from other conduit.
4. Chain, wire or perforated strap supports will not be acceptable. Nor are they acceptable as a means of securing the conduit.
5. Fasten the clamps and other supports as follows:

    a. For new masonry or concrete structures, install threaded metal inserts prior to pouring the concrete.
    b. For existing solid masonry or reinforced concrete structures:
        1. Install expansion anchors and bolts or approved power-set fasteners.
        2. Expansion anchors and bolts shall be not less that 1/4 inch diameter and shall extend not less than 3 inches into the concrete or masonry.

3. Power-set fasteners shall be not less than 1/4-inch diameter and shall extend not less than 1-1/4-inch into the concrete.

c. For hollow masonry install toggle bolts. Bolts supported only by plaster will not be accepted.

d. For metal structures install machine screws.

e. Attachments to wood plug, rawl plug, soft metal insert or wood blocking will not be permitted.

R. For vertical runs of conduit of EMT:

1. Install supports for conduit, EMT, cables and wires at intervals as required by the NEC and as indicated on the drawings.
2. Conduit and EMT supports shall be supported by framing for the floors.

S. Conduits and EMT shall be kept 6" away from parallel runs of steam or hot water pipes.

T. Clogged raceways shall be entirely free of obstructions or shall be replaced.

U. Rigid steel conduit installed underground and in concrete shall be wrapped with Scotchwrap #50 corrosion protection tape.

V. All empty conduits shall have nylon pull cord installed to provide for installation of cables, conductors or wiring. All empty conduits stubbed out below grade shall have be capped and provided with a concrete marker. All spare conduits stubbed up through slab shall have a cap installed to prevent debris from entering conduit.

W. Do not combine conduit homeruns. Each homerun shall be separately routed directly to panel unless specifically noted otherwise.

X. Install service conduit and all panel feeder conduits as follows:

1. All underground entrances shall have metallic sleeves through building foundation walls and extend to undisturbed ground to avoid shear, and shall be full weight, threaded hot-dipped galvanized rigid steel conduit.
2. All 90 degree bends to be rigid metallic conduit, with a radius of not less than 10 times the diameter of the conduit.
3. Maintain a minimum cover of 24 inches below final grade for conduits.

Y. Do not install conduit in cavity between concrete block and brick. Conduit shall not be stubbed up into this cavity or routed horizontally in cavity.

END OF SECTION

SECTION 260030

CONDUCTORS

1.01 SUBMITTALS

A. Shop drawings shall be submitted and shall consist of manufacturer's published literature.

1.02 MANUFACTURERS

A. Acceptable manufacturers are:

1.	General	6.	Cyprus Rome	13.	Colonial Wire
2.	Okonite	7.	Essex		
3.	Senator	8.	Carol		
4.	Triangle	9.	Southwire		
5.	Pirelli	10.	American		
11.	Cerro	12.	CME		

B. All wiring shall be manufactured in the United States.

1.03 MATERIALS

A. Ratings and sizes:

1. Shall be not less than indicated on the drawings and not less than required by the NEC.
2. Minimum size shall be No. 12 AWG copper provided the maximum voltage drops in the control circuits will not adversely affect the operation of the controls.
3. Conductor sizes indicated on the drawings are for copper conductors.

B. Conductors and ground wires:

1. Shall be copper.
2. Size No. 8 AWG and larger shall be stranded.
3. Size No. 10 AWG and smaller shall be solid.

C. Conductor insulation:

1. Conductor insulation shall be the NEC type THHN.

D. Wire shall be factory color coded in size No. 10 and smaller. Color shall be by integral pigmentation with a separate color for each phase, neutral and grounding conductor. Color code per phase shall be continuous throughout the project.

E. Manufacturer's name and other pertinent information shall be marked or molded clearly on the overall jacket's outside surface or incorporated on marker tapes within the cables and wires at reasonable intervals along the cables and wires.

F. Cables and wires indicated on the drawings for communication and signaling systems are for typical systems. Install cables and wires for the system being installed.

G. All wiring shall be in conduit unless specifically noted otherwise.

H. Every coil of wire shall be in the original wrapping and shall bear the Underwriters' Label of approval.

I. Where wires are left for connection to any fixture or an apparatus, spare wire or cables shall be provided at the ends for connections. Fixture connections at the outlet box shall be made with insulated wire connectors.

J. Outer jackets shall be color coded as follows:
   1. Three phase or single phase circuits, 120/208 volts:
      a. Phase A - Black
      b. Phase B - Red
      c. Phase C - Blue
      d. Neutral - White
      e. Insulated ground wire - Green

Note: Where dedicated neutrals are used for lighting and receptacle circuits. Outer jacket shall be white with appropriate colored tracer (i.e. white with red tracer, white with blue tracer, white with black tracer).

   2. Three phase or single phase circuits, 480/277 volts:
      a. Phase A - Brown.
      b. Phase B - Orange.
      c. Phase C - Yellow.
      d. Neutral - Gray.
      e. Insulated ground wire - Green.

Note: Where dedicated neutrals are used for lighting circuits. Outer jacket shall be grey with appropriate colored tracer (i.e. grey with brown tracer, grey with orange tracer, grey with yellow tracer).

   3. Only for large power cables and wires which do not have color coded jackets: No. 8 and larger.
      a. Install bands of adhesive non-fading colored tape or slip-on bands of colored plastic tubing over the cables and wires at their originating and terminations points and at all outlets of junction boxes.
      b. Color shall be permanent and shall withstand cleanings.

K. Wiring for signal circuits shall conform to the recommendations of manufacturers of the signal system being installed so the system shall have optimum performance and maximum service continuity. Communication and signaling circuit wiring where run in conduit below grade or in a damp location shall be listed for use in a damp or wet location. Communication and signaling conductors not in conduit shall be rated for plenum use.

L. No circuit wiring shall be smaller than number 12. Where the homerun exceeds 100'-0" in length, number 10 (minimum) wire shall be used even though all such circuits are not indicated on the plans.

M. When installing THHN extra care must be exercised so as not to damage nylon jacket. When nylon jacket is damaged wiring shall be removed from service, and replaced with new conductors.

END OF SECTION

SECTION 260040

OUTLETS

1.01 SUBMITTALS

A. Shop drawings shall be submitted and shall consist of manufacturer's published literature.

1.02 MANUFACTURERS

A. Acceptable manufacturers are:

1. Raco
2. Steel City
3. Appleton
4. Hubbell

1.03 MATERIALS

A. Boxes shall be galvanized pressed sheet steel for all concealed work.

B. Where conduit runs are exposed, outlet shall be of the cast metal type.

C. For concealed work each box shall be provided with a square cornered plaster ring.

D. Each surface lighting fixture, receptacle and switch shall be provided with flush mounted outlet box. All outlets installed in panels and other architectural features shall be centered. The location of any outlet may be moved as much as 10'-0" by the Architect before the outlet is placed without incurring any extra cost. All dimensions refer to the finished floor line. Outlet boxes shall be pressed sheet steel and shall be galvanized for all concealed work. Where conduit runs are exposed outlets shall be of the cast metal type.

E. Boxes shall be for the service and the type of outlet and shall not be less than 4" square and 1-1/2" deep except where otherwise specified. Boxes installed in walls shall be provided with a square cornered 1-1/2" plaster ring installed flush with surface of wall. Coordinate depth of plaster ring required for particular wall construction. Each outlet box above ceiling shall be supported from a structural member of the building either directly or by using a substantial and approved metal support. Conduit is not an approved means of support. Boxes installed in wall shall be supported either directly to a stud or between studs utilizing an approved bar hanger. In no case shall switch box support and clips used for mounting boxes in old work be used unless specifically called for. Top of outlet box shall be level.

F. All ceiling or wall recessed outlet boxes or their associated plaster rings shall be flush with the finished surface. Using coverplate to secure wiring devices or shimming the device is not acceptable. Contractor shall exercise due care when cutting opening in walls or ceilings for outlet boxes so that opening size will permit the proper installation of boxes and devices. Fixture studs in ceilings and bracket outlets shall be bolted with stove bolts or shall be locking type of stud mounting.

G. In addition to boxes indicated, install enough boxes to prevent damage to cables and wires during pulling-in operations.

H. Remove only knockouts as required and plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.

I. "There shall be no outlets installed back to back. A minimum of 4" shall separate each outlet."

J. Where the volume allowed per conductor exceeds that allowed in Table 370-6(b) of the NEC for the minimum size outlet specified, a larger size outlet box shall be used and shall be sized in accordance with the table noted above.

K. Outlet boxes shall be clean and free from dust, paint, dirt, plaster ready mix joint compound and /or any other debris.

L. Floor boxes shall be:

1. Steel City 665 Series or Walker RFB-4 concealed service floor box and hinged service top, 126 cubic inch total capacity.
2. Each box shall be equipped with 2-duplex receptacles, and provision for two low voltage devices. Coordinate low voltage device brackets with Low Voltage Systems Contractor and provide brackets accordingly to coordinate with devices installed.
3. Color of service top shall be as selected by the Architect.
4. Coordinate installation of floor covering with General Contractor.

1.04 LABELING AND IDENTIFICATION

All junction box cover plates shall be labeled identifying the system it contains. The label shall be neatly hand written with a wide tip permanent non-removable marker and be easily identified. Junction boxes containing line voltage wiring shall include panel and circuit designation (ex. HA - 1,3,5 or LA – 2,4,6). Junction boxes utilized for low voltage system shall be labeled in accordance with the system (ex. FA for Fire Alarm System).

END OF SECTION

SECTION 260050

WIRING DEVICES AND DEVICE PLATE

1.01 SUBMITTALS

A. Submit product data under provisions of Section 260000, GENERAL.

B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

1.02 REFERENCES

A. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet.

B. FS W-S-896 - Switch, Toggle.

C. NEMA WD 1 - General-Purpose Wiring Devices.

D. NEMA WD 5 - Specific-Purpose Wiring Devices.

1.03 MANUFACTURERS

A. For the purpose of selecting quality and type of device, equipment manufactured by Arrow Hart has been specified. The following manufacturers meeting this specification are acceptable:

1. Bryant
2. Pass and Seymour
3. Hubbell
4. Leviton

1.04 PRODUCTS

A. Switches: All wall switches shall be rated 20 ampere, 120/277 volts, have self grounding provisions, side wiring only and shall be of the silent type. Color shall be gray.

1. Single pole: Arrow Hart 1221.
2. Double pole single throw: Arrow Hart 1222.
3. Three way: Arrow Hart 1223.
4. Four way: Arrow Hart 1994.
5. Key switch single pole and three-way: Arrow-Hart 1191 and 1193 with 1187 cover plate, or Pass and Seymour equal. Three way and four way key switches shall be keyed alike.
6. Single pole, pilot light, red handle (lit in “on” position): Arrow Hart 2221PL.
7. Despard single pole switches installed in mullions. Arrow Hart QS791.

B. Receptacle: All receptacles shall be of the grounding type, Specification Grade, Tamper Resistant (TR) Rated of the configuration shown on the drawings and shall be flush wall mounting type. Color shall be gray. Any receptacles served from an emergency (generator backup) circuit shall be red.

1. Standard duplex receptacle: 20 ampere, 125 volt, NEMA type 5-20 R, 2 pole, 3 wire, straight blade, U-grounding slot, Specification grade Tamper Resistant (TR) Rated. Arrow Hart 5342. (TR)

2. Power, receptacle with matching plug: 20 ampere, 125/250 volt, NEMA type 14-20, 3 pole 4 wire grounded, straight blade type. Arrow Hart 5759

3. Power receptacle with matching plug: 20 ampere, 250 volt, NEMA type 6-20R 2-pole, 3 wire grounded, straight blade type. Arrow Hart 5461 GRY.

4. Power receptacle with matching plug: 30 ampere, 250 volt, NEMA type 6-30R 2-pole, 3 wire, u-grounded slot, straight blade type. Arrow Hart 5700 N.

5. Power receptacle with matching plug: 50 ampere, 125/250 volt, NEMA type 14-50R, 3-pole, 4 wire grounded, straight blade type. Arrow Hart 5754 N.

6. Ground fault interrupter receptacle: 20 ampere, 125 volts, NEMA type 5-20R, 2-pole, 3-wire with grounded U slot, Specification grade Tamper Resistant (TR) Rated. Arrow Hart AHGF 5342 (TR)

C. Device plates: Plates shall be furnished for all devices and outlets indicated on the drawings (telephone, computer, TV, etc.). All plates on masonry walls shall be oversized jumbo type.

1. Flush mounted plates: Beveled type with smooth rolled outer edge, stainless steel type 302 with brushed finish.
2. Surface box plates, beveled, galvanized steel, pressure formed for smooth edge to fit box.
3. Die cast weatherproof cover. Lockable hasp vertical mounting. Intermatic #WP1010MC.

1.05 INSTALLATION

A. Switches:

1. Switches shall be connected to the live side of the circuit and shall control only the outlets indicated.
2. Conductors shall be looped around the terminal screw.
3. Where more than one switch is indicated in the same location switches shall be gang mounted under a common plate.
4. Where multi-wire, 277 volt switching (480 volt potential) occurs, a barrier shall be provided between switches.

5. Center line of switches in general, shall be set 3'-6" above the floor (off position down) and shall clear the door trim or corner by 4" or center the space occupied.
6. Architectural plans shall be consulted before placing switches so they will in every case be located on the strike side of the door and clear door, chair, window, and baseboard moldings.
7. Switches shall be screwed tight to the boxes and shall not depend on the cover plate to pull them tight.

B. Receptacles:

1. Conductors shall be looped around the terminal screws, "DO NOT BACK WIRE DEVICES."
2. Receptacles shall be grounded by the green wire bond and shall be pigtailed as shown on the drawings.
3. Receptacles shall be screwed tight to the plaster ring or outlet box and shall not depend on the device plate to pull them tight.
4. Center line of general use receptacles shall be in general, set 18" above the floor with receptacle mounted in the vertical position and with grounding pole at the top.
5. Coordinate receptacle height with Architectural drawings and locate so that bottom of receptacle plate shall be 1" above counter or back splash and clear all moldings.
6. Center line of receptacles located adjacent to lavatories in toilets shall be set 3'-6" above floor.
7. Receptacles serving water coolers shall be located within cooler housing or as close to bottom of housing as possible. Cord serving unit shall be as short as possible. In no case shall cord or receptacle be seen from normal viewing angle.
8. All receptacles installed in bathrooms, toilets, within 6 feet of lavatories or sinks or on building exterior shall be ground fault circuit interrupter type.
9. All receptacles installed in kitchens or outdoors shall be GFCI type.

C. Plates:

1. Plates shall be level and all edges shall be in full contact with wall.
2. Plates shall be furnished for all devices and other outlets indicated on the drawings.
3. Install plates on outlet boxes and junction boxes in unfinished areas above ceilings and on surface mounted outlets.
4. Plates shall not be used to keep devices secure.
5. Plates shall be clean and free from dust, plaster or paint and spots.
6. Plate shall cover openings around outlets.

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END OF SECTION 26 0050

SECTION 260060

LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

B. Related Requirements:

1. Section 260065 for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 260090 "Lighting Control System" for panelboards used for lighting control.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.

6. Photometric data and adjustment factors based on laboratory tests[, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project] [IES LM-79] [and] [IES LM-80].

    a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
    b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each luminaire and for each color and texture with standard factory-applied finish.

D. Product Schedule: For luminaires and lamps.[Use same designations indicated on Drawings.]

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all fixture/lamp types used on Project; use ANSI and manufacturers' codes.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. Recessed Fixtures: Comply with NEMA LE 4.

D. Bulb shape complying with ANSI C79.1.

E. Lamp base complying with ANSI C81.61 or IEC 60061-1.

F. CRI of 80. CCT of 4000 K.

G. Rated lamp life of 50,000 hours.

H. Lamps dimmable from 100 percent to 0 percent of maximum light output.

I. Internal driver.

J. Nominal Operating Voltage: 120 V ac or 277 V ac.

1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

K. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat finish.

2.2 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat painted finish.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.3 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.4 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

B. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 14 gage.

C. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

D. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two 5/32-inch- diameter aircraft cable supports adjustable to 120 inches in length.
2. Ceiling mount with pendant mount with 5/32-inch diameter aircraft cable supports adjustable to 120 inches in length.
3. Ceiling mount with hook mount.

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing, rod or wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of two (2) locations, at opposite corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of two (2) locations, spaced at diagonal corners of luminaire. Install two (2) ceiling support wires attached at diagonal corners of fixture and routed and attached to structure above.

J. Flexible conduit and wiring from outlet box to fixture shall be minimum 3/8"C., and minimum #18 THHN conductors. Factory supplied whips of smaller ratings are not acceptable. Where 0-10 volt dimming is utilized, use #18 (TJP), grey/purple jacketed conductor integral to flex.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260120 "Equipment Identification."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 260065

OCCUPANCY SENSORS

1.01 SUBMITTALS

A. Manufacturer shall substantiate conformance to this specification by supplying the necessary documents, performance data and wiring diagrams. Any deviations to this specification must be clearly stated by letter and submitted.

B. *Submit a lighting plan clearly marked by manufacturer showing proper product, location and orientation of each sensor.*

C. Submit any interconnection diagrams per major subsystem showing proper wiring.

D. Submit standard catalog literature which includes performance specifications indicating compliance to the specification.

E. Catalog sheets must clearly state any load restrictions when used with electronic ballasts.

1.02 WORK INCLUDED

A. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein.

B. Contractor/Supplier shall examine all general specification provisions and drawings for related electrical work required as work under Division 16.

C. Contractor shall coordinate all work described in this section with all other applicable plans and specifications, including but not limited to wiring, conduit, fixtures, HVAC systems and building management systems.

1.03 ACCEPTABLE MANUFACTURERS

A. For the purpose of selecting quality and types of sensors, equipment as manufactured by “The Watt Stopper” has been specified. Following manufacturers meeting these specifications are acceptable.

1. Hubbell Building Automation
2. GreenGate
3. Leviton
4. Cooper Controls

B. The listing of any manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the electrical contractor to ensure that any price quotations received and submittals made are for sensors which meet or exceed the specifications included herein.

1.04 EQUIPMENT QUALIFICATION

A. Products supplied shall be from a single manufacturer that has been continuously involved in the manufacturing of occupancy sensors for a minimum of five (5) years. Mixing of manufacturers shall not be allowed.

B. All components shall be U.L. listed, offer a five (5) year warranty and meet all state and local applicable code requirements.

C. Products shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

D. Wall switch products must be capable of withstanding the effects of inrush current. Submittals shall clearly indicate the method used.

1.05 SYSTEM DESCRIPTION

A. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.

B. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.

C. Contractor shall warrant all equipment furnished in accordance to this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The supplier's obligation shall include repair or replacement, and testing without charge to the owner, all or any parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. The warranty shall commence upon the owner's acceptance of the project. Warranty on labor shall be for a minimum period of one (1) year.

1.06 SYSTEM OPERATION

A. It shall be the contractor's responsibility to make all proper adjustments to assure owner's satisfaction with the occupancy system.

B. Factory Startup - It shall be the manufacturer's responsibility to verify all proper adjustments and train owner's personnel to ensure owner's satisfaction with the occupancy system. This service shall be provided in contract amount at no additional cost to the Owner.

2.02 PRODUCTS

A. All products shall be Watt Stopper product numbers:

1. Ceiling sensors: WT-605, WT-600, WT-1105, WT-1100, WT-2205, WT-2200, WT-2250, WT-2255, W-500A, W-1000A, W-2000A, W-2000H, WPIR, DT-200, DT-205, CX-100, CX-105, CI-200, CI-205

2. Wall sensors: WI-200, WS-120/277, WA-100, WD-170, WD-180, WD-270, WD-280

3. Power and Slave Packs: B120E-P, B277E-P, C120E-P, C277E-P, S120/277-P, AT-120, AT-277

4. InteliSwitch: TS-200, TS-300, TS-200-24

B. Automatic wall switch sensor (PW-200):

1. The passive infrared wall switch sensor shall be a 3 wire, self contained control system that replaces a standard toggle switch. Sensor shall have ground wire for safety. Switching mechanism shall be latching air gap relay, compatible with electronic ballasts, compact fluorescent, and inductive loads. Triac and other harmonic generating devices shall not be allowed.

2. The passive infrared sensor shall be capable of detecting presence in the control area by detecting changes in the infrared energy.

Small movements shall be detected such as when a person is writing while seated at a desk.

3. To avoid false ON activations and to provide high sensitivity to minor motion, Pulse Count Processing and Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of the signal received by the sensor to ensure response only to those signals caused by human motion.

4. Sensor shall utilize mixed signal ASIC (application-specific integrated circuit) technology, which combines analog and digital processing into one chip package, to provide immunity to RFI and EMI.

5. Zero Crossing Circuitry shall be used to increase the relay life, protect from the effects of inrush current, and increase the sensor's longevity.

6. To assure detection at the desktop level uniformly across the space, sensor shall have a 2 level, 28 segment, multi-element Fresnel lens system.

7. Sensor shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens.

8. Fresnel lens shall be a Poly IR 4 based material to offer superior filtering capability of competing light sources, such as the sun and other visible light sources. Lens shall have grooves facing in to avoid dust and residue build-up which could affect IR reception.

9. Sensor shall cover up to 900 sq ft for walking motion, with a field of view of 180 degrees.

10. Sensor shall operate at either 120 VAC or 277 VAC.

11. Sensor shall have no minimum load requirement and shall be capable of switching 0 to 800 watt ballast or tungsten or 1/6 hp @ 120 volts, 60 Hz; 0 to 1200 watts for ballast or 1/3 hp @ 277 volts, 60 Hz.

12. Sensor shall have a built-in light level feature adjustable from 2 to 200 footcandles that holds lighting OFF when a desired footcandle level is present.

13. Sensor shall have a time delay adjustable from 30 seconds to 30 minutes.

14. Sensor shall have user-adjustable sensitivity setting.

15. Adjustments and mounting hardware shall be concealed under a removable cover to prevent tampering of adjustments and hardware.

16. For ease in installation and cleaner wiring, the sensor shall utilize terminal style wiring.

17. Sensor shall have in place a bypass pin which when removed will override sensor to ON and which requires no rewiring or modification to unit. To preserve savings and automatic operation, an attached, user accessible override-on feature shall not be allowed.

18. Sensor shall provide automatic equipment grounding to a metal junction box, and provide grounding to a metal cover plate.

19. For safety, sensor shall have 100% off switch with no leakage current to load in OFF mode.

20. For safety, in the event there is an open circuit in the AC line such as a ballast or lamp failure, the sensor shall automatically switch to OFF mode.

21. Sensor shall have two positions only: OFF and AUTO for normal operation.

22. Sensor shall not protrude more than 3/8” from the wall and shall blend in aesthetically.

23. For protection against lens damage, sensor shall utilize a full radius lens brace.

24. To ensure quality and reliability, sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

25. Color shall match all other wiring devices on project.

C. Vandal Resistant Automatic wall switch sensor (PW-200):

1. The passive infrared sensor shall be a completely self contained control system that replaces a standard toggle switch. Switching mechanism shall be a latching air gap relay, compatible with electronic ballasts, compact fluorescent, and inductive loads. Triac and other harmonic generating devices shall not be allowed. Sensor shall have ground wire and grounded strap for safety.

2. Sensor shall be capable of detecting presence in the control area by detecting changes in infrared energy. Small movements shall be detected, such as when a person is writing while seated at a desk.

3. Sensor shall utilize advanced control logic based on RISC (Reduced Instruction-Set Circuit) microcontroller.

4. Detection Signature Processing (DSP) shall be used to avoid false offs and false activations and to provide immunity to RFI and EMI.

5. Continuously adjusting Zero Cross relay control shall be used to guarantee reliable operation with non-linear loads (electronic, PL lamp ballasts) even with temperature changes and product aging. This increases the WA -200 product longevity.

6. Sensor shall utilize SmartSet™ technology to optimize the sensor behavior to fit occupant usage patterns and adjust sensitivity and time delay to changing conditions. The use of SmartSet shall be selectable by user with a DIP switch.

7. Sensor shall have a time delay that is adjusted automatically (with the SmartSet setting) or shall have a fixed time delay of 5, 10, 15, 20 or 30 minutes, walk-through mode, or test mode, set by DIP switch. In walk-through mode, lights shall turn off 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds.

8. Sensor shall have the choice of light flash alert and/or audible alert of impending light shut off, selectable with DIP switch.

9. Sensor shall have sensitivity adjustment that is set to either automatic (SmartSet setting) or reduced sensitivity, and is set with DIP switch.

10. Sensor shall have a built-in light level feature selectable with DIP switch. During set up of light level control, sensor shall learn desired hold-off level, requiring only one step.

11. Sensor shall have automatic-ON or manual-ON operation adjustable with DIP switch.

12. Sensor shall operate at universal voltages of 100, 120, 230, or 277 VAC; 50/60 Hz.

13. Sensor shall have no minimum load requirement and shall be capable of switching 0 to 800 watts fluorescent/incandescent or 1/6 hp @ 100/120VAC, 50/60 Hz; 0 to 1200 watts fluorescent or 1/6 hp @ 230/277VAC, 50/60 Hz.

14. Sensor shall utilize a temperature compensated, dual element sensor, and a multi-element Fresnel lens.

15. For vandal resistance, Fresnel lens shall be made of hard, 1.0mm Poly IR 2 material that offers greater sensitivity to motion and superior detection performance. Lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.

16. To assure detection at desktop level uniformly across the space, sensor shall have a 2 level, 28 segment, multi-element Fresnel lens system.

17. Sensor shall cover up to 300 sq ft for walking motion, with a field of view of 180 degrees.

18. Adjustments and mounting hardware shall be concealed under a removable, tamper resistant cover to prevent tampering of adjustments and hardware.

19. For safety, sensor shall have a 100% off switch with no leakage current to the load.

20. Sensor shall not protrude more than 3/8” from the wall and shall blend in aesthetically.

21. To ensure quality and reliability, sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

22. Color shall match all other wiring devices on project.

D. Dual Technology sensors:

1. The Dual Technology sensor shall be capable of detecting presence in the control area by detecting doppler shifts in transmitted ultrasound and passive infrared heat changes.

2. Sensor shall utilize Dual Sensing Verification Principle for coordination between ultrasonic and PIR technologies. Detection verification of both technologies must occur in order to activate lighting systems. Upon verification, detection by either shall hold lighting on.

3. Sensor shall have a retrigger feature in which detection by either technology shall retrigger the lighting system on within 5 seconds of being switched off.

4. Ultrasonic sensing shall be volumetric in coverage with a frequency of 40 KHz. It shall utilize Advanced Signal Processing which automatically adjusts the detection threshold dynamically to

compensate for constantly changing levels of activity and air flow throughout controlled space.

5. Sensor shall be capable of corner mounting to a wall or ceiling in order to eliminate detection through open doorways and outside of controlled area. To provide superior small motion detection and immediate activation upon entry, coverage of both technologies must be complete and overlapping throughout the controlled area.

6. To avoid false ON activations and to provide immunity to RFI and EMI, Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of a signal, to respond only to those signals caused by human motion.

7. Sensor shall operate at 24 VDC/VAC and halfwave rectified and utilize a Watt Stopper power pack.

8. The PIR technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. The lens shall be Poly IR4 material to offer superior performance in the infrared wavelengths and filter short wavelength IR, such as those emitted by the sun and other visible light sources. The lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.

9. The lens shall cover up to 2000 sq ft for walking motion when mounted at 10 ft and 1000 sq ft of desktop motion.

10. DT-200 sensors shall have an additional single-pole, double throw isolated relay with normally open, normally closed and common outputs. The isolated relay is for use with HVAC control, data logging, and other control options.

11. Sensors shall utilize SmartSet™ technology to optimize time delay and sensitivity settings to fit occupant usage patterns. The use of SmartSet shall be selectable with a DIP switch.

12. Sensors shall have a time delay that is adjusted automatically (with the SmartSet setting) or shall have a fixed time delay of 5 to 30 minutes, set by DIP switch.

13. Sensors shall feature a walk-through mode, where lights turn off 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds.

14. Sensor shall have an override ON function for use in the event of a failure.

15. Sensor shall have a built-in light level sensor that works from 10 to 300 footcandles.

16. Sensor shall have 8 occupancy logic options for customized control to meet application needs.

17. Sensor shall have a manual on function that is facilitated by installing a momentary switch.

18. Each sensing technology shall have an LED indicator that remains active at all times in order to verify detection within the area to be controlled. The LED can be disabled.

19. To ensure quality and reliability, sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

E. 360° Dual Technology sensors:

1. The Dual Technology sensor shall be capable of detecting presence in the control area by detecting doppler shifts in transmitted ultrasound and passive infrared heat changes.

2. Sensors shall use patent pending ultrasonic diffusion technology that spreads coverage to a wider area.

3. Sensor shall utilize Dual Sensing Verification Principle for coordination between ultrasonic and PIR technologies. Detection verification of both technologies must occur in order to activate lighting systems. Upon verification, detection by either shall hold lighting on.

4. Sensor shall have a retrigger feature in which detection by either technology shall retrigger the lighting system on within 5 seconds of being switched off.

5. Sensors shall be ceiling mounted with a flat, unobtrusive appearance and provide 360° coverage.

6. Ultrasonic sensing shall be volumetric in coverage with a frequency of 40 KHz. It shall utilize Advanced Signal Processing that automatically adjusts the detection threshold dynamically to compensate for changing levels of activity and airflow throughout controlled space.

7. To avoid false ON activations and to provide immunity to RFI and EMI, Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of a signal, to respond only to those signals caused by human motion.

8. The PIR technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. The lens shall be Poly IR4 material to offer superior performance in the infrared wavelengths and filter short wavelength IR, such as those emitted by the sun and other visible light sources. The lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.

9. DT-300 and DT-305 sensors shall operate at 24 VDC/VAC and halfwave rectified and utilize a Watt Stopper power pack.

10. DT-355 shall incorporate a switching power supply for reduced power consumption; shall operate at 120/230/277/347 VAC, 50/60 Hz and shall not require a power pack.

11. Sensors shall utilize SmartSet™ technology to optimize time delay and sensitivity settings to fit occupant usage patterns. The use of SmartSet shall be selectable with a DIP switch.

12. Sensors shall have a time delay that is adjusted automatically (with the SmartSet setting) or shall have a fixed time delay of 5 to 30 minutes, set by DIP switch.

13. Sensors shall feature a walk-through mode, where lights turn off 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds.

14. The DT-300 and DT-355 sensors shall have a built-in light level sensor that works from 10 to 300 footcandles.

15. The DT-300 and DT-305 sensors shall have a manual on function that is facilitated by installing a momentary switch.

16. Sensors shall have eight occupancy logic options that give the ability to customize control to meet application needs.

17. The sensors shall feature terminal style wiring, which makes installation easier.

18. DT-300 sensor shall have an additional single-pole, double throw isolated relay with normally open, normally closed and common outputs. The isolated relay is for use with HVAC control, data logging, and other control options.

19. Each sensing technology shall have an LED indicator that remains active at all times in order to verify detection within the area to be controlled. The LED can be disabled for applications that require less sensor visibility.

20. To ensure quality and reliability, sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

F. Ultrasonic sensors:

1. The ultrasonic occupancy sensors shall be capable of detecting presence in the floor area to be controlled by detecting doppler shifts in transmitted ultrasound.

2. Ultrasonic sensing shall be volumetric in coverage with a frequency of 32.768 kHz at ±0.002%. They shall utilize Advanced Signal Processing which automatically adjusts the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled areas.

3. Sensors of varying frequencies shall not be allowed so as to prevent sensors from interfering with each other and to assure compatibility in the event more sensors are added.

4. Sensors shall have temperature and humidity resistant, 32 kHz tuned ultrasonic receivers. Receivers shall have less than a 6dB shift in the humidity range of 10% to 90% and less than a 10dB shift in the temperature range of -20° to 60° C.

5. Detection shall be maintained when a person of average size and weight moves only within or a maximum distance of twelve inches either in a horizontal or vertical manner at the approximate speed of 12 inches per second. The sum of this distance, volume and speed represent the average condition ultrasonic sensors must meet in order for the lights to not go off when a person is reading or writing while seated at a desk.

6. Sensors shall have a DIP switch override-ON function for use in the event of failure. The LED is maintained ON so as to be visible from the floor as a constant reminder that the automatic function has been by-passed.

7. Sensors shall incorporate an output disable feature for easy troubleshooting.

8. Sensors shall be ceiling mounted and shall not protrude more than 1.50 inches to blend in aesthetically with the ceiling. The sensors shall offer two mounting options.

9. The WT-600, WT-1100, WT-2200, and WT-2250 shall have an additional single-pole, double-throw isolated relay with normally open, normally closed, and common outputs rated at 1 Amp for 24 VDC. The isolated relay is for use with HVAC control, data logging, and other control options.

10. For accuracy, sensors shall have a DIP switch controlled, digital time delay that shall be adjustable from 15 seconds to 30 minutes.

11. Sensors shall have user-adjustable sensitivity setting.

12. Sensors shall cover 360° and up to 600 square feet for WT-605 and WT-600, 1100 square feet for WT-1005 and WT-1100, and 2200 square feet for WT-2205 and WT-2200 of walking motion.

13. Hallway and corridor sensors shall be The Watt Stopper models WT-2255 and WT-2250 and shall cover up to 90 linear feet.

14. Sensitivity and timer controls shall be accessible from the front of the sensor and shall be concealed by a hinged cover.

15. To ensure quality and reliability, sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

G. Passive Infrared sensors:

1. The passive infrared sensor shall be capable of detecting presence in the control area by detecting changes in the infrared energy. Small movements shall be detected such as when a person is writing while seated at a desk within 15 feet of the sensor.

2. To avoid false ON activations and to provide high sensitivity to minor motion, Pulse Count Processing and Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of the signal received by the sensor to respond only to those signals caused by human motion.

3. Sensor shall utilize mixed signal ASIC (application-specific integrated circuit) technology, which combines analog and digital processing into one chip package, to provide immunity to RFI and EMI.

4. Sensor shall utilize a temperature compensated dual element sensor and a multi-element Fresnel lens.

5. Fresnel lens shall be a Poly IR 4 based material (for standard and Long Range lens) to offer superior filtering capability of competing light sources, such as the sun and other visible light sources. The lens shall have grooves facing in to avoid dust and residue build up which affects IR reception. Aisleway lenses shall be a Poly IR 2 based material that offers greater sensitivity to motion and superior detection performance.

6. To ensure sensitivity to small motion at the desk top, the sensor shall have a standard 30 element lens with 15 layers horizontally and 4 layers vertically; a 14 element Long Range lens with 9 layers horizontally and 4 layers vertically; a 9 element 1-sided Aisle Way lens with 9 layers vertically; or an 18 element 2-sided Aisle Way lens with 9 layers vertically.

7. Sensor shall cover up to 2000 square feet with the Standard Lens, up to 90 linear feet with the Long Range Lens, up to 120 linear feet

with the 2-Sided Aisle Way Lens, and up to 50 linear feet with the 1-Sided Aisle Way lens for walking motion when mounted at a ceiling height of 10 feet

8. The CX-100 shall have an additional single pole, double throw isolated relay with normally open, normally closed, and common outputs rated for 1 Amp at 24 VDC. The isolated relay is for use with HVAC control, data logging, and other control options.

9. The CX-100 shall have two outputs; one output is based on occupancy only and one is based on occupancy with a hold OFF and an internal photocell setting when a minimum light level is present (adjustable from 3 to 200 footcandles). CX-105 shall have only an occupancy based output.

10. For accuracy and consistency, sensor shall have a DIP switch controlled, digital time delay adjustable from 15 seconds to 30 minutes.

11. Sensor shall have user-adjustable sensitivity settings.

12. Sensor shall be furnished with a DIP switch override-ON function for use in the event of failure.

13. Adjustments and mounting hardware shall be concealed under a removable cover to prevent tampering of adjustments and hardware.

14. Sensor can be wired in parallel to allow coverage of large areas.

15. To ensure quality and reliability, sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

H. 360° Passive Infrared sensors:

1. The passive infrared sensor shall be capable of detecting presence in the control area by detecting changes in the infrared energy. Small movements shall be detected such as when a person is writing while seated at a desk within an 8 feet radius of the sensor.

2. To avoid false ON activations and to provide high sensitivity to minor motion, Pulse Count Processing and Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of the signal received by the sensor to respond only to those signals caused by human motion.

3. Sensor shall utilize mixed signal ASIC (application-specific integrated circuit) technology, which combines analog and digital processing into one chip package, to provide immunity to RFI and EMI.

4. Sensor shall utilize a temperature compensated dual element sensor and a multi-element Fresnel lens.

5. Fresnel lens shall be a Poly IR 4 based material to offer superior performance in the Infrared wavelengths and filter short wavelength infrared, such as those emitted by the sun and other visible light sources. Lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.

6. To ensure sensitivity to small motion at the desktop, the sensor shall have a 34 element Extended Range lens (standard) or a 55 element High Density lens.

7. Sensor shall cover 360°, up to 1200 square feet of walking motion with the Standard Lens and up to 500 square feet of walking motion with the High Density lens when mounted at a ceiling height of 8 feet.

8. Sensor shall not protrude more than 0.36 inches from the ceiling and shall blend in aesthetically.

9. The CI-200 sensor shall have an additional single pole, double throw isolated relay with normally open, normally closed, and common outputs rated for 1 Amp at 24 VDC. The isolated relay is for use with HVAC control, data logging, and other control options.

10. The CI-200 sensor shall have two outputs; one output is based on occupancy only and the other is based on occupancy with a hold OFF and an internal photocell setting when a minimum light level is present (adjustable from 4 to 190 footcandles). CI-205 shall have just one occupancy based output.

11. For accuracy and consistency, sensor shall have a DIP switch controlled, digital time delay, adjustable from 15 seconds to 30 minutes.

12. Sensor shall have DIP switch sensitivity setting adjustable from minimum to maximum.

13. Sensor shall be furnished with DIP switch override-ON function for use in the event of a failure.

14. Adjustments and mounting hardware shall be concealed under a removable cover to prevent tampering with adjustments and hardware.

15. Sensor shall be capable of being wired in parallel to allow coverage of large areas.

16. To ensure quality and reliability, sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

I. Power and Auxiliary Packs:

1. Power pack shall be a self-contained transformer and relay module measuring 1.6" x 2.75" x 1.6".

2. For ease and speed of installation, power and auxiliary relay pack shall have 1/2" snap-in nipple for 1/2" knockouts and mounting on outside of enclosure.

3. Power and auxiliary relay packs shall have dry contacts capable of switching 20 amp ballast load, 13 amp incandescent, 1 hp @ 120 VAC, 60Hz; 20 amp ballast @ 277 VAC, 60 Hz; 15 amp ballast @ 347 VAC, 60Hz; 15 amp ballast, 1 hp @ 220-240 VAC, 60 Hz; and 20 amp ballast, 13 amp incandescent, 1 hp @ 220-240 VAC, 50 Hz.

4. Power packs shall provide a 24 VDC, 150 mA output.

5. Power packs shall be capable of parallel wiring without regard to AC phases on primary.

6. Auxiliary relay packs shall be identical in physical size of power packs and contain no transformer power supply and shall switch 120VAC, 277 VAC, 347 VAC or low voltage.

7. Power pack can be used as a stand alone, low voltage switch, or can be wired to sensor for auto control.

8. Power and auxiliary relay packs shall have low voltage teflon coated leads, rated for 300 volts, suitable for use in plenum applications.

9. Power pack shall be UL 2043 rated, use UL94 V-O plenum rated plastic, and have low voltage teflon coated leads, rated for 300 volts

10. B120E-P, B230E-P, and B277E-P power packs shall utilize Zero Crossing Circuitry to protect from the effects of inrush current and increase product longevity.

11. To ensure quality and reliability, power and auxiliary relay packs shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

J. Where specified, passive infrared and dual technology sensors shall offer daylighting footcandle adjustment control and be able to accommodate dual level lighting.

K. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems and rated motor loads.

L. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.

M. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.

N. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. This control shall be recessed to prevent tampering.

O. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.

P. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.

Q. All sensors shall have UL rated, 94V-0 plastic enclosures.

2.03 CIRCUIT CONTROL HARDWARE - CU

A. Control Units - For ease of mounting, installation and future service, control unit(s) shall be able to externally mount through a 1/2" knock-out on a standard electrical enclosure and be an integrated, self-contained unit consisting internally of an isolated load switching control relay and a

transformer to provide low-voltage power. Control unit shall provide power to a minimum of two (2) sensors.

B. Relay Contacts shall have ratings of:
13A - 120 VAC Tungsten
20A - 120 VAC Ballast
20A - 277 VAC Ballast

C. Control wiring between sensors and controls units shall be Class II , 18-24 AWG, stranded U.L. Classified, plenum rated jacketed cable, and shall not be required to be in conduit. Cabling shall be supported per NEC and not run on top of acoustical tile ceiling. In areas where cabling cannot be routed concealed (i.e., no acoustical tile ceiling), cabling shall be routed in conduit.

D. Minimum acceptable wire gauge from the circuit control hardware relays shall be #14 AWG.

3.01 INSTALLATION

A. It shall be the contractor's responsibility to locate and aim sensory in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have ninety (90) to one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room.

B. It is the contractor’s responsibility to arrange a pre-installation meeting with the manufacturer's factory authorized representative, at the owner's facility, to verify placement of sensors and installation criteria.

C. Proper judgment must be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The contractor shall also provide, at the owner's facility, the training necessary to familiarize the owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

3.02 FACTORY COMMISSIONING

A. Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustments and sensor placement to ensure a trouble-free occupancy-based lighting control system. This service is provided in the contract at no additional cost to the Owner.

B. The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the scheduled commissioning date. Upon completion of the system fine tuning the factory authorized technician shall provide the proper training to the owner's personnel in the adjustment and maintenance of the sensors.

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END OF SECTION 26 0065

SECTION 260070

DISCONNECT SWITCHES

1.01 SUBMITTALS

A. Shop drawings shall be submitted and shall consist of manufacturer's published literature.

1.02 MANUFACTURERS

A. Acceptable manufacturers are:

1. Square "D" Company
2. G. E.
3. Siemens
4. Cutler Hammer

1.03 EQUIPMENT

A. Disconnect switches shall be provided for all motors and strip heaters located out of sight of motor controller, and where specifically indicated on the drawings. Disconnect switches shall disconnect all ungrounded conductors. When exposed to weather, enclosure shall be NEMA - 3R. Switches shall be installed to be fully accessible in accordance with Article 110-26 of the National Electrical Code.

B. All disconnects shall be heavy duty type and shall be equipped with factory installed equipment ground kit bonded to the can for grounding purposes.

C. For single phase motors, a single - or double-pole toggle switch, rated only for alternating current, will be acceptable for capacities less than 30 amperes, provided the ampere rating of the switch is at least 125 percent of the motor rating. Enclosed safety switches shall be horsepower rated in conformance with Table III of Fed. Spec. W-D-865. Switches shall disconnect all ungrounded conductors.

D. Each disconnect serving ground mounted exterior A/C units shall be equipped with a padlock (Master 3206) all keyed alike.

E. All disconnects shall be equipped with provisions to lock the handle in the OFF position.

F. All disconnects shall be fusible type, fused in accordance with the name plate data on the unit. Disconnects serving water heaters or resistance heat strips shall be fused at 125% of the full load amps of the unit.

G. Install fuses so that ampere rating can be read without having to remove fuses.

H. All fuses shall be as noted in Section 260015.

I. Disconnects shall be identified as required under Section 260120.

J. Maintain 3'-0" clearance in front of disconnect having voltage rating of 250 volts and 4'-0" clearance in front of disconnect having voltage rating of 480 volts. Do not locate disconnect over other electrical equipment (i.e.: transformers). See 260000-1.14-I.

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END OF SECTION 26 0070

SECTION 260100

PULL BOXES AND JUNCTION BOXES AND FITTINGS

1.01 PULL BOXES AND JUNCTION BOXES AND FITTINGS

A. Boxes shall be provided in the raceway systems wherever required for the pulling of wires and the making of connections.

B. Pull boxes of not less than the minimum size required by the National Electrical Code Article 370 shall be constructed of code-gauge galvanized sheet steel. Boxes shall be furnished with screw-fastened covers. Covers on flush wall mounted boxes in well appointed areas (offices, reception, classrooms, media center, etc) shall be minimum 1/16 302 stainless steel. Boxes located on the exterior of the building shall be watertight. Covers shall be secured with tamper proof screws.

C. Boxes shall be securely and rigidly fastened to the surface of which they are mounted or shall be supported from structural member of the building either directly or by using a substantial and approved metal rod or brace.

D. All boxes shall be so installed that the wiring contained in them can be rendered accessible without removing part of the building.

E. Where several circuits pass through a common pull box, the circuits shall be tagged to indicate clearly their electrical characteristics, circuit number and designation.

F. All junction boxes larger than 4" x 4" flush mounted in wall shall have overlapping cover plate to cover rough-in openings.

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END OF SECTION 26 0100

SECTION 260110

GROUNDING

PART 1 GENERAL:

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. The work required under this section of the specifications consists of furnishing, installation and connections of the building secondary grounding systems. Exterior branch circuit wiring and feeder conductors extended beyond the building are included. The building electrical system shall be a 3 phase, 4 wire grounded wye delta system supplemented with equipment grounding system. Equipment grounding system shall be established with equipment grounding conductors; the use of metallic raceways for equipment grounding is not acceptable.

1.03 QUALITY ASSURANCE

A. Industry Referenced Standards: The following specifications and standards are incorporated into and become a part of this Specification by Reference.

1. Underwriters' Laboratories, Inc. (UL) Publications:

No.44 Rubber-Insulated Wire & Cables
No.83 Thermoplastic-Insulated Wires
No.467 Electrical Grounding & Bonding Equipment
No.493 Thermoplastic-Insulated Underground Feeder & Branch Circuit Cables
No.486 Wire Connectors and Soldering Lugs

2. National Electrical Manufacturers' Standards (NEMA):

WC-5 Thermoplastic Insulated Wire & Cable
WC-7 Cross-Linked-Thermosetting Polyethylene Insulated Wire

3. National Fire Protection Association Publication (NFPA):

No.70 National Electrical Code (NEC)

B. Acceptable Manufacturers: Products produced by the following manufacturer which conform to this specification are acceptable.

1. Hydraulically applied conductor terminations:

a. Square D
b. Burndy
c. Ilsco
d. Scotch (3M)
e. Thomas and Betts (T&B)

f. Anderson

2. Mechanically applied (crimp) conductor terminations:

a. Scotch (3M)
b. Ideal
c. Thomas and Betts (T&B)
d. Burndy

PART 2 PRODUCTS:

2.01 GENERAL MATERIALS REQUIREMENTS

A. Provide all materials under this section of the specifications. All materials shall be new.
B. All materials shall be UL listed and bear a UL label.
C. Refer to the specific specification section for the description and requirements of materials mentioned herein for installation.

2.02 GROUNDING CONDUCTORS

A. Grounding electrode conductor shall be bare or green insulated copper conductor sized as indicated on the drawings.
B. Equipment grounding conductors shall be green insulated type THHN conductors sized as indicated on the drawings. Where size is not indicated on the drawings, conductor size shall be determined from the National Electrical Code table of sizes of equipment grounding conductors.
C. Bonding jumpers shall be flexible copper bonding jumpers sized in accordance with the National Electrical Code table on sizes of equipment grounding electrode conductors.

2.03 TRANSFORMERS & MOTOR CONTROLLERS

A. Provide a conductor termination grounding lug bonded to the enclosure of each transformer and motor controller.
B. Provide an equipment ground bar with bonding screw in each disconnect for grounding purposes.

2.04 DEVICES

A. Each receptacle and switch device shall be furnished with a grounding screw connected to the metallic device frame. Bond equipment grounding conductor to each outlet box. For isolated ground receptacles, bond equipment grounding conductor to box, and isolated ground conductor to device grounding screw.

2.05 GROUND RODS

A. Ground rods shall be 3/4" x 10'-0" copper clad steel. Connection to all ground rods shall be by exothermic weld.

PART 3 EXECUTION

3.01 INSTALLATION

A. Ground all non-current carrying parts of the electrical system, i.e., wireways, equipment enclosures and frames, junction and outlet boxes, machine frames

and other conductive items in close proximity with electrical circuits, to provide a low impedance path for potential grounded faults.

B. Service entrance and separately derived electrical systems, grounding electrode system.

1. The neutral conductor of the electrical service serving the premises wiring system shall be grounded to the ground bus bar in the service equipment which shall be grounded to the cold water system, the ground rod system, and other grounding electrodes specified herein or indicated on the drawings. Grounding electrode conductors shall be installed in rigid, non-metallic conduit to point of ground connection, unless subject to physical damage in which case they shall be installed in galvanized rigid steel. Where metallic conduit is permitted, bond conduit at both ends to grounding electrode conductor with a UL bonding bushing.
2. Make connection to main water line, fire sprinkler piping, and gas piping entering the building. Make connections ahead of any valve or fittings whose removal may interrupt ground continuity. Install a bonding jumper of the same size as the grounding conductor around the water meter.
3. Bond together the following systems to form the grounding electrode system. All system connections shall be made as close as possible to the service entrance equipment and each connected at the service entrance equipment ground bus. Do not connect electrode systems together except at ground bus.
   a. Cold water piping system
   b. Ground rod system
   c. Structural steel metal building frame, see detail on drawings
   d. Main re-bar in a foundation footing, for a concrete structure
   e. Fire sprinkler piping
   f. Gas piping
4. Grounding electrode connections to structural steel, reinforcing bars, ground rods, or where indicated on the drawings shall be with chemical exothermic weld connection devices recommended for the particular connection type. Connections to piping shall be with UL listed mechanical ground clamps.
5. Bonding shall be in accordance with the National Electrical Code.
6. Install ground rods where indicated on the drawings with the top of the ground rods 12" below finished grade.

C. Equipment Grounding Conductor

1. Grounding conductors shall be provided in all branch circuit raceways and cables. Grounding conductors shall be the same AWG size as branch circuit conductors.
2. Grounding conductors for feeders are typically indicated on the drawings and the raceway is sized to accommodate grounding conductor shown. Where grounding conductor size is not indicated on the drawings, conductor shall be in accordance with the equipment grounding conductor table of the National Electrical Code.
3. A grounding conductor shall be installed in all flexible conduit installations. For branch circuits, grounding conductor shall be sized to match branch circuit conductors.

4. A feeder serving several panelboards shall have a continuous grounding conductor which shall be connected to each related cabinet grounding bar.
5. The equipment grounding conductor shall be attached to equipment with bolt or sheet metal screw used for no other purpose. Where grounding conductor is stranded, attachment shall be made with lug attached to grounding conductor with crimping tools.
6. Ground all motors by drilling and tapping the bottom of the motor junction box with a round head bolt used for no other purpose. Conductor attachment shall be through the use of a lug attached to conductor with a crimping tool.
7. Equipment grounding conductors shall terminate on panelboard, switchboard, or motor control center grounding bus only. Do not terminate on neutral bus. Provide a single terminals lug for each conductor. Conductor shall terminate the same section as the phase conductors originate. Do not terminate neutral conductors on the ground bus.

C. Other Grounding Requirements

1. Each telephone backboard and data network rack shall be provided with a No.6 grounding conductor. Ground conductor shall be routed to ground bar in nearest panel. Terminate conductor by stapling to backboard. Provide 6' slack conductor. If conductor is routed in a metal conduit, provide a grounding bushing at conduit end and bond to lug on ground bushing.
2. Lighting fixtures shall be grounded with a green insulated ground wire secured to the fixture with a UL listed bond lug, screw, or clip specifically made for such use.
3. Provide grounding as required for Division 17 equipment. Coordinate grounding requirements with Division 17 Contractor.

3.02 TESTING

A. Upon completion of the ground rod installation, grounding resistance reading shall be taken before connection is made to the building cold water piping system. Ground resistance readings shall not be taken within forty-eight hours of rainfall. Results of ground resistance readings shall be forwarded, in writing, immediately to the Architect and Owner.

END OF SECTION

SECTION 260120

EQUIPMENT IDENTIFICATION

1.01 SUBMITTALS

A. Submit sample of laminated plastic identification plate with lettering.

1.02 MATERIALS

A. Laminated plastic plates with 3/16" high white letter etched on black background.

B. Plates shall be permanently mounted utilizing pop rivets or a permanent mastic/epoxy.

C. Painted, stenciled or indented tape identification is not acceptable.

1.03 ITEM IDENTIFICATION

A. All electrical apparatus such as wiring troughs, panelboards, individual circuit breakers, transformers and disconnect switches shall have laminated plastic identification plates. Identification shall match labeling shown on plans.

B. A "steel" circuit directory frame permanently attached at factory (not glued), and a directory card with a plastic covering shall be provided on the inside of each panel door. The directory shall be typed to identify the load fed by each circuit and the areas served. Spaces or room numbers shown on the drawings are not necessarily the final numbers to be assigned to these areas. The Contractors shall before completion of the project obtain from the Architect final space or room numbers so that it can be typed onto directory.

C. Circuit breakers and disconnects shall identify the equipment served and circuit and panel from which it is served.

D. On all panelboards the exterior identification plate shall match that on the drawings and the panel and circuit number serving the panel shall be designated within the panel.

E. All junction box covers shall be clearly labeled with a sharpie permanent marker. Note load served (i.e. – lights, receptacles) and panel/circuit number (i.e. – HA-1.3,5) as well as low voltage systems (i.e. – fire alarm, intercom, etc.).

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END OF SECTION 26 0120

SECTION 260160

TRANSIENT VOLTAGE SURGE SUPPRESSORS FOR MAIN SERVICES AND DISTRIBUTION PANELS

1.01 SUBMITTALS

A. Electrical and mechanical drawings for the TVSS shall be provided by the manufacturer which show unit dimensions, weights, mounting provisions, connection details and layout diagram of the unit.

B. The manufacturer shall furnish an equipment manual with installation, operation, and maintenance instructions for the specified unit.

C. Documentation of unit's UL 1449 suppression rating shall be included as required product data submittal information.

D. The contractor shall provide detailed compliance exception statements to all provisions of this specification ten (10) days prior to the bid date.

1.02 MANUFACTURERS

A. For the purpose of selecting quality and type of TVSS units, equipment as manufactured by Current Technology Inc. has been specified. The following manufacturers meeting these specifications are acceptable.

1. Innovative Technology, Inc.
2. Surge Suppression, Inc.
3. Liebert
4. LEA Dynatech
5. Clipper Power Systems

B. The manufacturer shall provide a Limited Five-Year Warranty, from the date of installation, against failure when installed in compliance with applicable national/local electrical codes and the manufacturer's recommended installation, operation and maintenance instructions.

1.03 GENERAL

A. These specifications describe the electrical and mechanical requirements for a high-energy suppression filter system utilizing transient voltage surge suppression (TVSS) for application in Category C (Main Service Entrance) and Category B (Distribution Panels) areas as defined by the IEEE C62.41 standard.

B. The specified unit shall provide effective high energy transient voltage clamping and surge current diversion for all electrical modes of equipment connected downstream from the facility's main distribution panel or main over current device. The unit shall be designed for parallel connection to the facility's wiring system.

C. All Category B (distribution panels) shall include a high frequency attenuation filter for all modes of protection the TVSS is providing.

D. The unit shall include, but not be limited to, an engineered solid-state high-performance suppression system, utilizing Selenium Cells and/or arrays of fused non-linear voltage dependent Metal Oxide Varistors (MOV).

E. The suppression system shall not utilize gas tubes, spark gaps, or any other components which might short or crowbar the line, thus leading to interruption of normal power to connected loads. The suppression system shall not incorporate non-field replaceable fusing, circuit boards, plug-in or quick-connect connections as part of any surge current carrying path.

F. All internal wiring associated with the suppression filter system and subject to surge currents shall utilize low-impedance copper bus bar and/or copper conductor or equal. All internal connections associated with the suppression/filter system and which are subject to surge currents shall be made with compression type solder less lugs and shall be bolted in place.

G. The unit shall be connected to the panel or switch gear by means of a circuit breaker as specified on the drawings or as recommended by the manufacturer. An integral fused disconnect shall not be furnished with the unit unless otherwise specified. Provide breaker at panel per manufacturer's recommendation.

H. Units shall be provided in a NEMA 1 type enclosure constructed of minimum 14 gauge steel, painted inside and out with rust inhibiting paint. Surface or flush mount enclosures are specified on the drawings.

I. The unit shall be installed as close as practical to the wiring system in accordance with applicable national/local electrical codes and the manufacturer's recommended installation instructions. Maximum 6' connections shall be made with copper conductor and shall not be any longer than is reasonably necessary, avoiding unnecessary bends. When possible, current carrying conductors between the panelboard and the suppression unit shall be twisted together.

J. The unit shall include mechanical lugs for each phase, neutral and ground, where applicable. The lugs shall accommodate up to a 1/0 AWG copper conductor.

K. The unit shall include externally mounted visual indicators that monitor the on-line status of each phase of the unit (L.E.D.s, neon lamps, etc.).

L. The unit shall include the manufacturer's nameplate and UL inspection labels on interior of cabinet.

1.04 STANDARDS

A. The specified unit shall be designed, manufactured and tested in compliance with the following standards:

1. American National Standards Institute and Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.41-1991 and C62.45-1987).
2. National Electrical Manufacturers Association (NEMA).
3. National Fire Protection Association (NFPA 70, (NEC), 75, and 78).
4. Underwriters Laboratories (UL 1449 and 1283).

B. The maximum continuous operating voltage (MCOV) or threshold voltage of all suppression components utilized in the unit shall not be less than 125% of the facility's nominal operating voltage for 120 volt systems and not less than 115% of the facility's nominal operating voltage for 208, 277, and 480 volts.

C. Based on ANSI/IEEE C62.41-1991's standard 8/20 microsecond current waveform, and in accordance with NEMA Publication No. LS 1-1992, the tested single-pulse surge current capacity, in amps, of the unit shall be no less than the following:

	MODE OF PROTECTION		
	L-N	L-G	N-G
Main Service Panel:	150,000	150,000	150,000
Total Rating:	300,000		
Distribution Panels:	40,000	40,000	40,000
Total Rating:	80,000		

D. The unit shall be UL 1449 Listed as a Transient Voltage Surge Suppressor.

E. The unit shall be factory tested following IEEE C62.41 and C62.45 guidelines without failing or degrading the UL 1449 Surge Suppression Rating by more than 10%.

F. In accordance with NEMA Standard LS 1-1992, the suppression unit shall provide protection modes as follows:

1. Five (5) modes of protection for a single phase configuration:

   € Line-to-Neutral (2)
   € Line-to-ground (2)
   € Neutral-to-ground (1)

2. Seven (7) modes of protection for a three phase wye configuration:

   € Line-to-Neutral (3)
   € Line-to-Ground (3)
   € Neutral-to-Ground (1)

G. The environmental operating parameters for the unit shall meet or exceed the following conditions:

1. Operating temperature range shall be -40 to +60 C (-40 to +140 F).
2. Operation shall be reliable in an environment with 5% to 95% non-condensing relative humidity.
3. The unit shall not generate noise levels in excess of 10dB, "A" weighted.
4. No appreciable magnetic fields shall be generated. Unit shall be capable of use directly in computer rooms in any location without danger to data storage systems or devices.

H. For purposes of quality assurance, the unit shall be "burned-in" at the factory, applying nominal voltages for which a particular unit is designed.

I. A list of customer-replaceable spare parts where applicable shall be included in the unit's documentation set.

END OF SECTION

SECTION 260175

FIRESTOPPING

1.01 RELATED DOCUMENTS

A. The requirements of the general conditions, supplementary conditions, and division 1, general requirements, apply to Work in this Section.

1.02 DESCRIPTION

A. This Section describes the requirements for furnishing and installing firestopping for fire-rated construction. This includes:

1. All openings in fire-rated floors and wall assemblies, both blank (empty) and those accommodating penetrating items such as cables, conduits, etc.

1.03 REFERENCES

A. ASTM E 814: "Standard Method of Fire Tests of Through-Penetration Firestops"
B. UL 1479, UBC 7-5: (both are same as A above)
C. ASTM E 119: "Standard Method of Fire Tests of Building Construction and Materials"
D. UL263, UBC 7-1: (both are same as C above)
E. UL 2079: "Standard for Tests for the Fire Resistance of Building Joint Systems"
F. Published Through-Penetration Systems by recognized independent testing agencies.

1. UL Fire Resistance Directory.
2. Warnock Hersey Certification Listings, current year.

1.04 QUALITY ASSURANCE

A. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM 814, UL 1479 or UL 2079. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated. T rating, when required by code authority, shall be based on the measurement of the temperature rise on the penetrating item(s). The fire test pressure differential of a minimum 0.01 inches of water column is required.
B. Fire stopping products shall be asbestos free, free of any PCBs and free of any lead.
C. Do not use any product containing solvents, or that require hazardous waste disposal.

1.05 SUBMITTALS

A. Submit manufacturer's product literature for each type of Firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance, limitation criteria and test data.
B. Submit manufacturer's Warranty.
C. Material Safety Data Sheets: Submit MSDS for each firestop product.

D. Shop Drawings: Show typical installation details for methods of installation. Indicate which firestop materials will be used where and thickness for different hourly ratings.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in the manufacturers' original, unopened containers or packages with manufacturers' name, product identification, lot number, UL or Warnock Hersey labels, and mixing and installation instructions, as applicable.
B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturer.
C. All firestop materials shall be installed prior to expiration of shelf life.

1.07 PROJECT CONDITIONS

A. Verify existing conditions and substrates before starting work.
B. Do not use materials that are based on organic solvents.
C. During installation, provide masking and drop cloths to prevent firestopping products from contaminating any adjacent surfaces.
D. Conform to ventilation requirements by manufacturer's installation instructions or Material Safety Data Sheet.
E. Weather Conditions: Do not proceed with installation of firestop products when temperatures are in excess of or below the manufacturer's recommendations.
F. Schedule installation of firestop products after completion of penetration item installation but prior to covering or concealing of openings.
G. Coordinate this work with work of other trades.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following manufacturers as shown below and further defined by the materials listed in Part 2.02 of this section.

1. The RectorSeal Corporation. Products as listed are a standard of generic types.
2. International Protective Coatings
3. 3M Company
4. Hilti

2.02 MATERIALS

A. Firestop Mortars:

1. Metacaulk Fire Rated Mortar by The RectorSeal Corporation
2. KBS Mortar by International Protective Coatings
3. HILTI FS635 Firestop Compound

B. Firestop Sealants and Caulks:

1. Metacaulk 950 by The RectorSeal Corporation
2. Metacaulk 835 by The RectorSeal Corporation
3. Metacaulk 805 by The RectorSeal Corporation
4. Metacaulk 1000 by The RectorSeal Corporation
5. CP 25WB+Caulk by 3M
6. Flame-Safe FS900 Series by International Protective Coatings.
7. HILTI FS-One Intumescent Firestop Sealant

C. Firestop Putty:

1. Metacaulk Fire Rated Putty by The RectorSeal Corporation
2. Metacaulk Fire Rated Putty pads by The RectorSeal Corporation
3. MPS-2 Moldable Putty Stix by 3M
4. MPP-4S Moldable Putty Pads by 3M
5. HILTI CP618 Firestop Putty

D. Firestop Sleeves:

1. Metacaulk Pipe Collars by The RectorSeal Corporation
2. Plastic Pipe Devices by 3M
3. HILTI CP6421643 Firestop Collar

E. Intumescent Wrap Strips:

1. Metacaulk Wrap Strip by The RectorSeal Corporation
2. FS-195 Wrap Strip by 3M
3. HILTI

F. Firestop Mastic:

1. Metacaulk 1100 by The RectorSeal Corporation
2. HILTI
3. 3M

G. Accessories:

1. Forming/Damming Materials: Mineral Fiberboard or other type recommended by manufacturer.
2. Primer, sealant and solvent cleaner: As recommended by firestop manufacturer.

H. Where subject to movement, firestop products used shall remain flexible to allow for such normal movement of building structure and penetrating item(s) without affecting the integrity of the firestop system.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions where firestops are to be installed and notify the Architect of conditions detrimental to proper and timely completion of the work.

B. Verify the penetrating item(s) are permanently installed and construction of fire rated assemblies are completed prior to firestop installation.

C. Prior to installation of firestop systems, clean surfaces of penetrating item(s) that will be in contact with firestop materials. Do not use any cleaning material that will either attack penetrating item(s) or firestop product to be installed.

3.02 CONDITIONS REQUIRING FIRESTOPPING

A. General:

1. Provide fire stopping for conditions specified whether or not firestopping is indicated, and, if indicated, whether such material is designated as insulation, safing or otherwise.
2. Insulation types specified in other Sections shall not be installed in lieu of firestopping material specified herein.

B. Penetrations:

1. Penetrations include conduit, cable, wire, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.
2. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces in accordance with ASTM E 814 (UL 1479).
3. These requirements for penetrations shall apply whether or not sleeves have been provided. Firestop the annular space between sleeve and surrounding surfaces.

C. Provide firestopping to fill miscellaneous voids and openings in fire rated construction in a manner essentially the same as specified herein before.

D. All junction boxes larger than 4' x 4" located in a rated wall shall be protected on sides and back of box with firestop putty pads as required to maintain integrity of rated wall.

3.03 INSTALLATION

A. Regulatory requirements: Install firestop products in accordance with fire rated test assemblies as published by either UL or Warnock Hersey or accordance with manufacturer engineer drawings.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration firestop systems.

1. Firestop all holes or voids made in fire resistive assemblies, made by penetrations, to ensure against the passage of flames, smoke, and toxic gases.
2. Protect materials from damage on surface subjected to traffic and install cover plate as required on any installed firestop system that will or may be subject to traffic.
3. Tool surfaces of firestop products to provide a smooth and clean appearance.

3.04 FIELD QUALITY CONTROL

A. Follow safety procedures recommended in Material Safety Data Sheets.
B. Examine penetration firestopped areas to ensure proper installation before concealing or enclosing areas.
C. Keep areas of work accessible until inspection by Architect.

3.05 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving areas in undamaged and clean conditions.
B. Neatly cut and trim materials.

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END OF SECTION 26 0175

SECTION 260190

ENGINE GENERATOR SET

1.01 GENERAL

A. Requirements contained in this Specification shall apply to and govern the work under this Section.

1.02 WORK INCLUDED

A. Provide labor and material necessary to install a standby natural gas engine-generator set of the latest commercial type and design as specified herein.

1.03 SUBMITTALS

A. The Contractor shall furnish information showing manufacturers' model number, dimensions, and weights for the engine, generator, and major auxiliary equipment.

1.04 MANUFACTURERS

A. The following manufacturers meeting these specifications are acceptable:
   1. Onan
   2. Caterpillar/Olympian
   3. Kohler
   4. Generac

1.05 SUBSTITUTIONS

A. Proposed deviations from the specifications shall be treated as follows:

   1. Request for substitutions shall be made a minimum of ten (10) days prior to bid date. Manufacturers catalog data shall accompany each request and authorized acceptance shall be by addenda only.
   2. Under no circumstances will assemblers of units be acceptable. To qualify as a manufacturer, the engine or alternator must be the item manufactured and the completed engine generator set supplied by that manufacturer's authorized dealer only.
   3. The Contractor shall submit copies of pertinent drawings and schematic diagrams for approval and shall include the following:

      a. Engine generator set including plans and elevations or riser views clearly indicating entrance points for each of the interconnections required.
      b. Engine generator/exciter control cubicle.
      c. Fuel consumption rate curves at various loads, ventilation and combustion CFM requirements.
      d. Exhaust mufflers and vibration isolators.
      e. Battery Charger, battery, and battery racks.
      f. Automatic load transfer switch.
      g. Actual electrical diagrams including schematic diagrams and interconnection wiring diagrams for all equipment to be provided.
      h. Legends for all devices on all diagrams.
      i. Sequence of operation explanations for all portions of all schematic wiring diagrams.

4. The specified standby KW shall be for continuous electrical service during interruption of the normal utility source and shall be certified to this effect by the manufacturer for the actual unit supplied.
5. These ratings must be substantiated by manufacturer's standard published curves. Special ratings or maximum ratings are not acceptable.

1.06 MATERIALS

A. Engine: The engine shall be 1800 RPM, water-cooled in line or Vee type four-stroke cycle, natural gas fuel. The engine shall be equipped with lube oil, and intake air filters, lube oil cooler, engine driven water pump, and unit mounted instruments, water temperature gauge, lubrication oil pressure gauge, and battery charging ammeter.

1. Governor - A gear driven hydraulic governor shall maintain frequency regulation not to exceed 3% (1.8 hertz) from no load to full rated load.
2. Mounting - The units shall be mounted on a structural steel sub-base and shall be provided with suitable spring-type isolators.
3. Safety Devices - Safety shut-off for high water temperature, low oil pressure, over-speed, and engine over-crank shall be provided.
4. Guards - Guards shall be provided over all exposed moving parts as required by OSHA.

B. Generator:

1. The generator shall be rated for continuous stand-by service at at 0.8 power factor, 277/480 volts, three phase, four wire, 60 hertz, 1800 RPM. See drawings for KW/KVA ratings.

2. The generator shall be a three phase, 60 hertz, single bearing, rotating field, synchronous type built to NEMA standards. A voltage regulator shall be provided to match the characteristics of the generator and engine. Voltage regulation shall be + - 2% from no load to full rated load. Readily accessible voltage drop, voltage level and voltage gain controls shall be provided. Voltage level adjustments shall be a minimum of + - 5%. Generator and exciter shall be inherently capable of parallel operation with other power sources of equivalent electrical characteristics, and stator shall include a twelve lead, re-connectable buss bar system for easy load connection.

3. Entire generator assembly shall be UL2200 listed.

C. Cooling System:

1. Radiator - A radiator with blower type fan shall be sized to maintain safe operation 110 degrees F ambient temperature. Air flow restriction from the radiator shall not exceed 0.5" HO.
2. The engine cooling system shall be pre-treated by the system supplier for the inhibition of internal corrosion, and freezing.

D. Weather Proof Housing and Exhaust Muffler;

1. Housing shall consist of a weather proof enclosure to completely enclose the engine generator and accessories. Housing shall protect the engine generator from the environment, yet be conductive to easy maintenance.

Housing shall have removable swing out doors on each side and lockable rear door for access to meters and controls. Side doors shall have a means to pad lock. Construction of housing shall be of a minimum 14 gauge sheet steel and painted manufacturers standard color.

2. Exhaust muffler shall be mounted on top of housing. The exhaust muffler shall be a critical grade muffler. Muffler shall be factory installed so that its weight is not supported by the engine. A flexible exhaust fitting shall be supplied and installed between the muffler and exhaust manifold. All accessories shall be factory installed. This includes flanges, muffler, tail pipe and rain cap.

E. Automatic Starting System:

1. Starting Motor - A DC electric starting system with positive engagement shall be furnished. The motor voltage shall be as recommended by the engine manufacturer.
2. Automatic Control - fully automatic generator set start-stop controls in the generator control panel shall be provided. Controls shall provide shutdown for low oil pressure, high water temperature, over speed, over crank. Controls shall include a 30 second single cranking cycle limit with lockout.
3. Jacket Water Heater - A unit mounted thermal circulation type water heater incorporating a thermostatic switch shall be furnished to maintain engine jacket water to 70 degrees F. the heater shall be 120 volt, single phase, 60 hertz. Provide pressure switch actuated by oil pressure to shut down heater when oil pressure reaches running pressure.
4. Battery Charging Alternator - A belt driven battery charging alternator rated 24 volts, 35 amp DC shall be provided with transistorized voltage regulator.
5. Batteries - A lead - acid storage battery set of the heavy duty diesel starting type shall be provided. Battery voltage shall be compatible with the starting system. The battery set shall be rated no less than 220 amp-hours. Necessary cables and clamps shall be provided.
6. Battery Racks - Battery racks shall be provided for each battery and shall conform to NEC 480 - 7 (a) (1). They shall be constructed of metal and so treated as to be resistant to deteriorating action by battery electrolyte. Further, construction shall be such that nonconducting insulation material directly supports the cells.
7. Battery Charger - A current limiting battery charger shall be furnished to automatically recharge batteries. Chargers shall float at 2.17 volts per cell. It shall include overload protection, silicon diode full wave rectifiers, voltage surge suppressor, DC ammeter, DC volt- meter, and fused AC input. AC input voltage shall be 120 volts, single phase. Amperage output shall be no less than 6 amperes.

F. Generator Control Panel:

1. Type - A generator mounted NEMA 3R type vibration isolated 14 gauge steel control panel shall be provided. Panel shall contain, but not be limited to, the following equipment:

   a. Frequency meter, 3 ½ inch, dial type.
   b. Voltmeter, 3 ½ inch, 2% accuracy.
   c. Ammeter, 3 ½ inch, 2 % accuracy.
   d. Ammeter - Voltmeter phase selector switch.
   e. Automatic starting controls as specified.

f. Voltage level adjustment rheostat.
g. Dry contacts for remote alarm wired to terminal strips.
h. Individual fault indicator lights for low oil pressure, high water temperature, over speed, and over crank.
i. Three position function switch marked, RUN-STOP and REMOTE.
j. Running time meter, oil pressure, battery charging ammeter, and water temperature gauges.

G. Main Line Circuit Breakers:

1. Type A main line, molded case circuit breakers mounted upon and sized as shown on the drawings shall be installed as a load circuit interrupting and protection device. They shall operate both manually for normal switching functions and automatically during overload and short circuit conditions.
2. The trip unit for each pole shall have elements providing inverse time delay during overload conditions and instantaneous magnetic tripping for short circuit protection. The circuit breakers shall meet standards established by Underwriters Laboratories National Electric Manufacturer's Association, and National Electrical Code.

H. Automatic Load Transfer Switch(es):

1. The amperage rating of the automatic load transfer switch shall be as shown on drawings.

2. Each automatic transfer switch shall be mechanically held on both the emergency and the normal side, and rated for continuous duty in an unventilated enclosure. The switches shall be double throw with the main contacts rigidly and mechanically interlocked to insure only two possible positions: Normal or Emergency. A manual operator must be provided to enable manual operation.

3. Rating and Performance: The automatic load transfer control shall be rated for continuous duty when enclosed in a non-ventilated NEMA 1 enclosure. It shall be rated for all classes of load including inductive and non-inductive at 600 volts and tungsten lamp load at 250 volts. The transfer switch portion of the control shall be designed, built, and tested to close on an inrush current up to and including twenty (20) times the continuous rating of the switch without welding or excessive burning of the contacts. The transfer switch shall be capable of switching load up to and including fifteen (15) times the continuous rating of the switch and capable of enduring six thousand (6000) cycles of operation, at rated current, at a rate of six (6) cycles per minute, without failure. One cycle shall consist of one complete opening and closure of both sets of contacts on an inrush current of ten (10) times the continuous rating of the switch.

4. Each transfer switch shall be listed under U.L. 1008, and approved by Canadian Standards Association. Switches utilizing reversing contactor mechanisms as a means to transfer load are disallowed and will not be considered.

5. Accessories to transfer switches; All automatic load transfer switches shall include the following accessories:

a. Engine starting contacts to provide for generator starting from each unit independent of the other.
b. Full phase protection. Three phase relays shall be field adjustable, close differential type with 92-95% pickup and 82-85% drop out. Relays are to be connected across live lines.
c. Test switch, to simulate a power outage.
d. Adjustable time delay on engine starting to over-ride momentary outages and nuisance voltage dips.
e. Adjustable time delay on transfer of load to emergency source. Adjustable time delay to open transfer switch contact to allow motor loads to decay.
f. Adjustable time delay on retransfer to load to normal with 5 minute cool-down timer wherein the generator set runs unloaded after transfer to line.
g. Plant exerciser to start and run the generator set with or without load each 168 hours for a 30 minute interval. Selector switch will be provided for with load or without load testing.
h. One auxiliary contact closed on emergency and one auxiliary contact open on emergency.
i. Pilot lights to indicate the normal and emergency position of the transfer switch.
j. Isolated (ungrounded neutral bar).
k. Disconnect plug.
l. Time delay neutral, programmed transition, or in phase monitor.

I. Annunciator Panel: A flush recessed panel shall be provided for remote mounting in the Administrative Area or as shown on the drawings to give audible and visual warning of fault or alarm conditions in the generator set. Wiring and conduit shall be as required by the system manufacturer. The panel shall conform with the requirements of the National Electrical Code, Section 700-12, and the National Fire Protection Associates publication, NFPA No. 110-3-5.5.1, Level One.

J. Transient voltage surge protection shall be provided protecting all low voltage circuits serving the transfer switch and the annunciator. EDCO or equal.

K. Provide one (1) remote emergency power off button. Provide Nema 3R enclosure for outdoor locations. Contractor to connect such to generator. Provide label at EPO per NFPA Code.

1.07 MANUFACTURING

A. The engine, including engine block, oil pan, and cylinder heads, generator and all major items of auxiliary equipment shall be manufactured in the U. S. by manufacturers currently engaged in the production of such equipment.
B. The unit shall be shipped to the job site by the manufacturer's authorized dealer having a parts and service facility within a 75 mile radius of the job site. In addition, and in order not to penalize the owner for unnecessary or prolonged periods of time for service or repairs to the emergency system, the bidding generator set supplier must have no less than eighty percent (80%) of all engine replacement parts in his stock at all times. Certified proof of this requirement shall be available from the dealer.

1.08 TESTING

A. Prior to acceptance of the installation, equipment shall be tested to show it is free of any defects and will start automatically and be subjected to full load test through the use of existing loads and, dry type load banks supplied for this purpose at the job site by the generator set supplier.

B. Load bank testing shall be done in the presence of the Owner's engineer or his appointed representative only after the unit is permanently installed in accordance with the plans and specifications. If testing is completed without benefit of Engineers presence, testing shall be done again in his presence. Testing shall be for a period of four (4) hours under full load.

C. Contractor shall supply all fuel necessary for load bank testing and shall before final acceptance of generator unit top off tank leaving it full.

1.09 CERTIFICATE TEST REPORTS, MANUALS AND INSTRUCTIONS

A. Prior to the final inspection, deliver 4 copies of the following items to the Engineer:

1. A certificate by the manufacturer of the engine-generator set that the auxiliary electrical power system has been properly installed, adjusted and tested.
2. Certified copies of all of the factory and construction site test data sheets and reports for the engine-generator set and major auxiliaries.
3. Complete operating and maintenance manuals for the engine-generator set and auxiliaries including wiring diagrams, technical data sheets and information for ordering replaceable parts:

    a. Include complete interconnection diagrams which indicate all components of the system.
    b. Include complete diagrams of the internal wiring for each of the items of equipment.
    c. The diagrams shall have their terminals identified to facilitate installation, operation and maintenance.

B. Laminate or mount under plexiglas a set of operating instructions for the system and install it under a neat frame, adjacent to transfer switch.

C. Provide signage, in accordance with section 16120, at main electrical service entrance equipment to indicate type and location of on-site emergency generator per N.E.C. 700.8(a).

D. Furnish the services of a competent, factory-trained engineer or technician for instructing operating and maintenance personnel on the proper operation and maintenance of the system at the time of testing.

1.10 SYSTEM SERVICE CONTRACT

A. The supplier of the standby power system shall provide a copy of and make available to the owner his standard service contract which, at the owner's option, may be accepted or refused. This contract will accompany any documents, drawings, catalog cuts, specification sheets, wiring, or outline drawings, etc. Submitted for approval to the designing engineer. The contract shall be for the complete power system.

1.11 WARRANTY

A. The complete standby electrical system furnished under this Section shall be guaranteed against defective parts and workmanship under terms of the manufacturer's and dealer's standard warranty. Provide five (5) year or 3000 hour extended warranty from date of end of manufacturers warranty. Manuracturers warranty to begin at acceptance of the system and shall include labor, parts and travel time for necessary repairs at the job site. Extended warranty shall include labor, parts and travel time for necessary repairs at the job site. Warranty information shall be submitted along with construction site test data sheets. This information shall list starting and ending dates and who is to be contacted for warranty service.

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END OF SECTION 26 0190

SECTION 260210

DATA/VOICE CONDUIT AND OUTLET SYSTEM

1.01 CONDUIT SYSTEM

A. Provide a complete system of conduits and outlet boxes for data and voice wiring. Each data, data/voice or voice outlet shall have a 1" conduit routed from the flushed recessed outlet box up to the accessible ceiling space above. Turn conduit out above ceiling with a 90° horizontal elbow and terminate with an insulated bushing. Where ceiling finish is exposed structure (i.e. no acoustical tile ceiling), extend conduit to an area with an accessible gypboard/acoustical ceiling. Provide nylon pull string in conduit.

B. All conduit and outlet boxes shall be for data and voice cable only. Joint use with sound systems, fire, telephone, etc. it is not acceptable.

C. Location of outlets shall be as shown on the drawings.

D. Height of wall outlets shall be as noted on the drawings. All wall outlet boxes in new construction shall be two gang type, 4" x 4" x 2 1/8" deep, with single gang plaster rings. Plaster rings shall be flush with finish of wall. Coordinate depth of plaster ring required with type of wall construction.

E. Install a quaduplex receptacle at the telephone backboard and serve with a dedicated 20 ampere 120 volt circuit. The telephone shall consist of one - 3/4" x 4' x 8' plywood. Paint all sides and edges to match room finish. Install a #6 ground conductor from the nearest ground bar in panel, provide 8'-0" of coiled slack at board. Plywood shall be fire rated. Paint shall be fire retardant.

F. See site plan for routing of telephone service conduit. Prior to routing of conduit, coordinate an on-site meeting with local utility company to determine exact location. Provide a 200 pound minimum pull strength nylon cord in the service conduit. Cap off any conduit not utilized.

G. Each data network rack shall be grounded with a #6 copper routed in ½" conduit to the ground bar in the nearest panel. If conduit is metal, provide grounding bushings at each end of conduit. Provide a quadruplex receptacle at each data network rack and serve from a dedicated 20 amp, 120 volt circuit.

H. Conduit and its installation shall be as covered under Section 260020 of these specifications.

I. Device boxes and their installation shall be covered under Section 260040 of these specifications.

J. All conduit shall be concealed unless otherwise noted.

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END OF SECTION 26 0210

SECTION 260220

ELECTRICAL CONSTRUCTION REVIEWS, INSPECTION, AND TESTING

1.01 GENERAL

A. Comply with Division 1 - General Requirements.

1.02 CONSTRUCTION REVIEWS

A. The Architect or his representative shall observe and review the installation of all electrical systems shown on the drawings and as specified herein.

B. Before covering or concealing any conduit below grade or slab, in wall or above ceiling, the contractor shall notify the Architect so that he can review the installation.

1.03 CONTRACTOR'S FINAL INSPECTION

A. At the time of the Contractor's final inspection, all systems shall be checked and tested for proper installation and operation by the Contractor in the presence of the Architect or his representative.

B. The Contractor shall furnish the personnel, tools and equipment required to inspect and test all systems.

C. Following is a list of items that the contractor must demonstrate to the Architect or his representative as complying with the plans and specifications. Please note that this list does not necessarily represent all items to be covered in the final inspection, but should give the Contractor an idea of what is to be reviewed.

1. Service ground, show connection to ground rod and cold water main.

2. Demonstrate that main service equipment is properly bonded.

3. Demonstrate that all panels have breakers as specified, ground bar, copper bus, typed directory for circuit identification and that they are free of trash.

4. Demonstrate that all conduits are supported as required by the National Electrical Code.

5. Demonstrate that all outlet boxes above or on the ceiling are supported as required by the National Electrical Code.

6. Demonstrate that outlet boxes in wall or ceilings of combustible materials are flush with surface of wall or ceiling, and that outlet boxes in walls or ceilings of non-combustible materials are so installed that the front edge of the box or plaster ring is not set back more than 1/4".

7. Demonstrate that outlet boxes in wall are secure.

8. Demonstrate that all devices are properly secured to boxes, that device plates are properly aligned and are not being used to secure device.

9. Utilizing a Woodhead No. 1750 testing device, demonstrate that all 125 volt receptacles are properly connected.

10. Demonstrate that all fixtures have specified LED light source, drivers and lens, and that they are supported as required by the National Electrical Code and as called for on the drawings or in the specifications.

11. Demonstrate that all disconnects requiring fuses are fused with the proper size and type, and that all disconnects are properly identified.

END OF SECTION

SECTION 262050
VIDEO SURVEILLANCE (CCTV) SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes a new video surveillance (CCTV) system consisting of based CCTV system with its associated equipment. CAT-6e cabling and drops to each CCTV camera are installed under this division.

1.3 DEFINITIONS

A. AGC: Automatic gain control.

B. BNC: Bayonet Neill-Concelman - type of connector.

C. COL: Color Only

D. CCD: Charge-coupled device.

E. FTP: File transfer protocol.

F. IP: Internet protocol.

G. LAN: Local area network.

H. MPEG: Moving picture experts group.

I. NTSC: National Television System Committee.

J. PC: Personal computer.

K. PTZ: Pan-tilt-zoom.

L. RAID: Redundant array of independent disks.

M. TCP: Transmission control protocol - connects hosts on the Internet.

N. UPS: Uninterruptible power supply.

O. WAN: Wide area network.

P. POE: Power Over Ethernet

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
4. UPS: Sizing calculations.
5. Wiring Diagrams: For power, signal, and control wiring.

C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

D. Seismic Qualification Certificates: For video surveillance, cameras, camera-supporting equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Field quality-control reports.

F. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

G. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NECA 1.

C. Comply with NFPA 70.

D. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components, except central-station control unit, installed in air-conditioned, temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
2. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of [minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick]. Use NEMA 250, Type 3R enclosures.
3. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Owner Acceptance.

B. Factgory dealer representative for system shall respond to all service calls within 4 normal working hours. Submit letter to Owner at project closeout and with submittal drawings confirming such.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Video-signal format shall comply with NTSC standard, composite interlaced video. Composite video-signal termination shall be 100 ohms.

B. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Division 26 0000 Section "Transient Voltage Suppression."
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Ditek #DTK-PVP1P surge suppression device, or equals by EDCO and Leviton.

2.2 STANDARD EXTERIOR CAMERAS

A. Manufacturers: Axis is basis of design. Equals by Hikvision, Bosch or Pelco are acceptable.

B. IP Speed Dome Outdoor Camera (Axis M1114 Series with Pelco EH5512/MT) : Designed for exterior locations, with a weathertight surface mounting and all required mounting accessories, megapixel camera with vandal proof cover, and aluminum body. Quantity as shown on drawings.

1. Suitable for exterior environment, rated for continuous operation in ambient temperatures of minus 50 to plus 122 deg F dry bulb and up to 85 percent relative humidity.
2. Pickup Device: Progressive Scan CMOS, Varifocal 3-8mm, 1.3 MegaPixel.
3. Horizontal Resolution: 720 lines.
4. Signal-to-Noise Ratio: Not less than 50 dB.
5. With AGC and automatic backlight compensation.
6. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of 0.05 lux at F1.4, 1/60s (NTTC), 1/50s (PAL).
7. Manually selectable modes for backlight compensation or normal lighting.
8. Fixed.
9. Preset Positioning: Eight user-definable scenes, each allowing 16-character titles. Controls shall include the following:

a. In "sequence mode," camera shall continuously sequence through preset positions, with dwell time and sequencing under operator control.
b. Motion detection and tracking shall be available at each camera position.
c. Up to four preset positions may be selected to be activated by an alarm. Each of the alarm positions may be programmed to output a response signal.

10. Scanning Synchronization: Determined by external synch over the CAT 6 cable. Camera shall revert to internally generated synchronization on loss of external synch signal. Full duplex capable.
11. White Balance: Auto-tracing white balance.
12. Motion Detector: Hardware motion detection, Digital Input/Output.
13. Dome shall support multiplexed control communications using CAT 6 cable recommended by manufacturer.
14. Lens: 3.4~119mm focal length; 35x zoom ratio; F1.4(Wide), F4.2 (Tele) with 55.8° (W) ~1.7° (T) diagonal angle; 4.6 sec (1x to 35x) zoom speed; X1~X12
15. Power: Power Over Ethernet. 7-20V DC.
16. Heavy-duty weatherproof with IP66 protection and vandal proof cover.
17. Surface, flush and wall mount supported.

2.3 STANDARD INTERIOR CAMERAS

A. Manufacturers: Axis is basis of design. Equals by Hikvision, Bosch or Pelco are acceptable.

B. IP Speed Dome Indoor Camera (Axis P3301-V): Designed for interior locations, surface mounted with all required mounting accessories, dome with vandal proof cover, and aluminum body. Quantity as shown on drawings.

1. Pickup Device: Progressive Scan CMOS, Varifocal 2.8-10mm, 1280 (H) by 800 (V)] 1.3 megapixels.
2. Horizontal Resolution: 1280 lines.
3. Signal-to-Noise Ratio: Not less than 50 dB.
4. H.264 compliant

5. With AGC and automatic backlight compensation.
6. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of 1 at F1.3, 1/40s (NTTC), 1/50s (PAL).
7. Manually selectable modes for backlight compensation or normal lighting.
8. Fixed Dome Networking Camera with Vandal Resistant Casing.
9. Preset Positioning: Eight user-definable scenes, each allowing 16-character titles. Controls shall include the following:

a. In "sequence mode," camera shall continuously sequence through preset positions, with dwell time and sequencing under operator control.
b. Motion detection shall be available at each camera position.
c. Up to four preset positions may be selected to be activated by an alarm. Each of the alarm positions may be programmed to output a response signal.

10. Scanning Synchronization: Determined by external synch over the CAT 6 cable. Camera shall revert to internally generated synchronization on loss of external synch signal. Half duplex capable.
11. White Balance: Auto-tracing white balance.
12. Motion Detector: Video motion and Audio detection.
13. Dome shall support multiplexed control communications using CAT 6 cable recommended by manufacturer.
14. Provide surface or wall mount supports where shown in areas without acoustical tile ceiling.
15. Built in audio microphone.
16. Power: Power Over Ethernet. 4.9-5.1V DC.

2.4 LENSES

A. Manufacturers: Axis is basis of design. Equals by Hikvision, Bosch or Pelco are acceptable.

B. Description: Optical-quality coated lens, designed specifically for video-surveillance applications and matched to specified camera. Provide color-corrected lenses with color cameras.

1. Auto-Iris Lens: Electrically controlled iris with circuit set to maintain a constant video level in varying lighting conditions.
2. Fixed Lens: With calibrated focus ring.
3. Zoom Lens: Motorized, remote-controlled unit, rated as "quiet operating." Features include the following:

a. Electrical Leads: Filtered to minimize video signal interference.
b. Motor Speed: Variable.
c. Lens shall be available with preset positioning capability to recall the position of specific scenes.

2.5 CAMERA-SUPPORTING EQUIPMENT

A. Manufacturers: Axis is basis of design. Equals by Bosch or Pelco are acceptable.

B. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.

C. Mounting Brackets for Fixed Cameras: Type matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.

2.6 SIGNAL TRANSMISSION COMPONENTS

A. Manufacturers: Exacqvision (by Exacq Technologies) is basis of design. Equals by Video Insight and Genetech are acceptable.

1. Cat. 6e cabling and jacks in accordance with Section 270210 shall be provided for the complete CCTV system.

B. EQUIPMENT:

1. EXACQVISION NVR (quantity of services to match camera lenses) IP video server, minimum IP camera licenses as required for 110% of quantity of cameras shown, Dell Poweredge R700 2U, quad core xeon processor, 720fps display, 180 fps at D1, 6 TB storage, 2 GB memory, Gigabit ethernet port, rack design. Locate in "MC" rack. Equals by Genetech or Video Insight.

*Building shall have minimum of camera licenses for 100% of quantity of cameras shown at project completion and exacqVision Pro software for viewing cameras.

2. Provide quantity one (1)-32" flat panel commercial LCD display and mini desktop computer (equal to Lenovo Think Centre M53 Tiny Desktop with DisplayPort and network RJ45 port) mounted concealed behind it for displaying multiple camera live views. Computer shall be programmed to allow downloading, control streaming content via LAN/WAN and full networking capability. Monitor shall have VGA, DisplayPort, HDMI inputs minimum and two 5W built-in speakers. Display shall be by Samsung or equal by Sony, Panasonic, Sharp, LG. Locate displays as shown on plans. Provide power outlet, 4 11/16" square junction box, network drop with patch cord and mount as required to mount display.
3. EXACQVISION web client "Monitor Station" application to be installed on Owner provided computer in Administration Office. Total of three(3) computer locations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

B. Examine roughing-in for LAN, WAN, and IP network before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras and infrared illuminators level and plumb.

B. Install cameras with 84-inch minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

C. Install power supplies and other auxiliary components at control stations unless otherwise indicated.

D. Avoid ground loops by making ground connections only at the control station.

E. Identify system components, wiring, cabling, and terminals according to Division 26 0000 Section "Electrical Identification."

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:

a. Prepare equipment list described in "Submittals" Article.
b. Verify operation of auto-iris lenses.
c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet (17 to 23 m) away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
e. Set and name all preset positions; consult Owner's personnel.
f. Set sensitivity of motion detection.
g. Connect and verify responses to alarms.
h. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

E. Video surveillance system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.4 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
3. Adjust all preset positions; consult Owner's personnel.
4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.
5. Provide a written report of adjustments and recommendations.

3.5 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

3.6 CCTV RACK SPECIFICATIONS: (SEE SECTION 270210)

3.8 DEMONSTRATION

Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment. Include programming as necessary to integrate CCTV software to Owner provided computers.

END OF SECTION

SECTION 270140

FIRE ALARM SYSTEM

1.01 SUBMITTALS

A. Shop drawings shall be submitted as follows:

1. Manufacturer's published literature.
2. One line schematic diagram covering the complete building system.

1.02 MANUFACTURERS

A. Acceptable manufacturers are:

1. Notifier
2. Honeywell
3. Johnson Controls

B. The acceptable manufacturers systems listed in 1.02 A, shall be installed by the authorized local factory dealer/representative for that product. The factory dealer representative shall hold a current low voltage contractor's license.

Any interested parties shall submit a company resume showing years in business, certification stating that he is an authorized representative for the manufacturer of the equipment he is submitting for approval and that he maintains a fully equipped and stocked service shop and shall respond to service calls within 12 normal working hours, list of key personnel, copies of appropriate licenses and list of recently completed jobs during the normal prior approval period.

1.03 SCOPE

A. This specification covers the installation of a complete electronically operated fire alarm system. The system within the building shall be electrically supervised voice evacuation and shall include, but not be limited to, the following components:

1. Manual non-code type alarm boxes, combination speakers and flashing light, control equipment, duct smoke detectors, ceiling smoke detectors, carbon monoxide detectors, door hold-open devices, fireman’s phone system for elevators, conduit, and wiring.

1.04 GENERAL REQUIREMENTS

A. The alarm equipment and all wiring shall be installed and interconnected by a factory certified installer and placed in working order. The name of the manufacturer and serial or identification numbers shall appear on all major components. Electrical supervision of the system shall conform to provisions of Article 240. NFPA Standard 72. Corresponding parts of all similar type

equipment units shall be interchangeable, and locks for all cabinets shall be keyed alike. All devices, equipment and combination thereof shall be of the manufacturer's current production. All component parts of the system and the control unit shall be approved for the purpose intended. The stamp, label, seal or certificate of the Underwriter's Laboratories or the Factory Mutual Laboratories shall be considered as acceptable evidence of such approval.

B. Fire Alarm Subcontractor shall submit a certification stating that he is an authorized representative for the manufacturer of the equipment he is submitting for approval and that he maintains a fully equipped and stocked service shop and shall respond to service within 12 normal working hours.

C. Contractor shall include in base bid factoring training and certification of two employees of the Owner. Any electronic equipment such as laptops, etc., required to program system shall be provided.

D. Contractor shall inculde in base bid all necessary components at fire alarm control panel to provide for 20% spare capacity for future portables.

1.05 DRAWINGS AND MANUALS

A. Three copies of complete instructions for the operation, inspection, testing and maintenance of the system, including wiring diagrams and replacement parts list shall be furnished upon final acceptance of the system. Also provide all special tools that are necessary for the maintenance of the equipment and include one set of fuses for each type and size.

1.06 INSTALLATION

A. A qualified fire alarm technician shall install, adjust and test the equipment. The technician shall be qualified by training and experience in the installation and operation of the fire alarm system specified. The technician shall instruct operating personnel in the operation, adjustment and maintenance of the system. A statement signed by the person or persons instructed shall be supplied to the Architect prior to final operation.

B. Provide a written certification that the system is in complete and proper working order and in compliance with all codes.

1.07 SYSTEM OPERATION

A. Operation of any manual or automatic initiating device shall cause a general alarm to sound.

B. Also circuits and audible sounding devices shall be electrically supervised. In the event of an open circuit or ground in the system, loss of operation of supervisory power, or other supervised component failure, a trouble signal shall be actuated until the system is restored to normal. A silencing switch shall be provided for silencing the trouble alarm.

C. The system shall operate from one 120 volt circuit.

D. Fire Alarm System shall be interlocked with range hood extinguishing system, such that when system is activated, general alarm is sounded and signal is sent to the annunciator. Provide control module to activate shunt trip breaker serving cooking equipment beneath hood.

E. The Fire Alarm shall be interfaced with the elevator controllers.

1.08 SYSTEM COMPONENTS

A. Fire alarm control panels: Furnish and install where shown an addressable control panel mounted in a surfaced mounted code gauge steel cabinet, equipped with lock and keys. Panel shall be voice evacuation equipped with digital voice announcements and microphone for voice override. The control shall provide in one cabinet all necessary relays, resistors, compensators and power supplies for the signal circuits and duct type smoke detectors shown on the drawings and which are designated for 24 volt D.C. operation. Each signal circuit shall be capable of handling up to 10-24 volt D.C. horns. Provide battery backup with trickle charger.

The panel shall include an auxiliary relay with contacts for interrupting power to the door holders release devices upon sounding of a general alarm. The time limit cutout shall be adjustable and shall instantly reset after system has been restored. On the cabinet door shall be mounted millimeter, trouble lights, silencing switch and reset switch.

The Fire Alarm Panel shall be 100% field programmable and field editable without the use of any exterior programming devices (i.e., laptop computer or chip-burning device). The Fire Alarm System shall have alarm verification, as well as a maintenance type alert function to warn of contaminated detectors before a false alarm occurs.

Each device in the field must be individually addressed with a point I.D. and Alphanumeric read-out.

The panel shall be equipped with a UL listed digital dialer for off premises central station monitoring.

B. Fire alarm subcontractor shall determine the load based on the fire alarm device layout and provide additional power supply modules as required. Coordinate with Division 26 for 120 volt circuit for power supply. Label panelboard schedules accordingly.

C. Manual stations: Provide manual alarm stations, semi-flush mounted, of the pull-lever type, key resettable. Housing shall be of cast metal or impact resistance plastic with raised letters designating function and operating instructions. Housing will be red enamel with white lettering.

D. Signal device: Provide combination low power D.C. speaker/strobe with high intensity flashing strobe light for both audible (voice evacuation) and visual signaling or strobe light for visual signalling only. Minimum sound level indoors at 10 feet shall be 90 db. Maximum current draw for horn and strobe light of 0.063 amps, nominal voltage of 24 D.C. Units shall be flush wall mounted 6'-10" above the finished floor at points noted on the drawings. Minimum candela level shall be 75 candela. Candela level for areas under 300 square feet may be 15. All strobes in a common area shall be synchronized

E. Smoke detectors shall be furnished, installed and connected under Division 27. Power supply for detectors shall be 24 volt D.C. and supplied from Fire Alarm control panel. Detectors shall be photo electric type. Each detector shall have flashing LED for operational walk check.

F. Smoke detectors in duct work shall be photo electric type furnished and connected under Division 27, installation in duct work shall be accomplished by Mechanical Contractor. Power supply for detectors shall be 24 volts D.C. and supplied from fire alarm control panel. Provide contacts to automatically shut down fan motors. Sampling tubes shall extend across the entire width of the duct. Provide remote station at readily accessible location in mechanical room, or if air handling unit is above ceiling, mount remote station in wall below ceiling, having LED to indicate alarm condition and key switch to test and reset alarm relay. Mount remote station 6'-0" above finished floor. Detectors for air handling equipment rated over 2000 CFM, but under 15,000 CFM shall be located in the supply duct. Detectors for air handling equipment rated over 15,000 CFM shall be located in the supply and return ducts. Detectors shall be provided whether called for on the plans or not. Look up code section and reference. Location of detectors in duct work shall be as recommended by detector manufacturer, but in no case shall detector be located ahead of filters. Location of duct detectors shown are schematic in nature only. Verify exact location with unit and duct work placement. Where duct detector is required to be on building exterior, provide weatherproof detector.

G. Electronic door holders and contact plates shall be furnished under Section 26 of the specifications. Units shall be magnetic type installed on the wall or floor. Provide ceiling mounted smoke detectors on each side of door. Electro magnetic units shall be connected and installed under Section 27 and powered at 24 volts D.C. from the fire alarm control panel. Door contact plate shall be installed by General Contractor. Division 27 Contractor shall provide contact plate extension rods as required.

H. Tamper switches and flow switches shall be provided and installed by fire protection contractor, and connected under Division 27. Power supply shall be 24 volts D.C., supplied from the fire alarm control panel.

I. Heat detectors, where called for, shall be provided, installed and connected under Division 27. Detectors shall be combination rate of rise and fixed temperature rated for a minimum of 135^{o} F, and shall be rated at 200^{o} F where required (i.e., Kitchen).

J. Each fire alarm circuit shall be protected from lightning by installing surge protection devices either internally or externally. Circuits run between buildings shall be individually protected in addition to protection at control panel.

K. All conductors (by Division 27) shall be installed in conduit furnished by Division 26. Conduit installation shall be carefully coordinated with Division 26. All fire alarm conduit, J-boxes and covers shall be red.

L. Number and size of conductors shall be as required by manufacturer of system being installed. Any cable run in conduit below grade shall be moisture proof, cable shall be equal to West Penn Aqua seal.

M. At time of final inspection, Contractor shall turn over a red-lined set of plans showing device location, device address, and device descriptor. Panel shall be fully programmed to denote location of addressable device. Provide a written report denoting that all fire alarm devices have been tested and are operable.

N. Where a post indicator valve for fire sprinkler system is provided, Contractor shall provide a fire alarm system connection to tamper switch. Connection to such shall be waterproof. Provide lightning/surge protection devices at conductors serving such. Refer to civil plan for exact location of post indicator valve.

O. Provide lightning arrestor surge protection modules for all cabling routed from fire alarm control.

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END OF SECTION 27 0140

SECTION 270210

DATA/VOICE NETWORK CABLING SYSTEM

1.01 SUBMITTALS

A. Prior to start of any work, contractor shall submit shop drawings as follows:

1. Manufacturer's published literature for each separate type of equipment being provided. Indicate model number on cutsheet.
2. One line schematic of complete system showing a floor plan to scale. Show locations and the type of outlets, as well as all rack locations, and estimated maximum distances to each rack.
3. Documentation of testing on all wiring and terminations as per EIA/TIA standards.

1.02 MANUFACTURERS

A. Acceptable manufacturers for each type of equipment specified shall be as noted throughout this specification section.

B. The acceptable manufacturers noted shall be installed by the authorized local factory dealer/representative for that product.

C. The contractor shall hold a current low voltage contractor's license and RCDD certificate. Any other interested parties shall submit a company resume showing years in business, certification stating that he is an authorized representative for the manufacturer of the equipment he is submitting for approval and that he maintains a fully equipped and stocked service shop and shall respond to service calls within 12 normal working hours, list of key personnel, copies of appropriate licenses and list of recently completed jobs. Submittal must be received no later than ten business days prior to bid date in order to be considered.

1.03 GENERAL

A. Workmanship
All work shall be performed in a workmanlike manner. Architect, Engineer, and/or Owner may observe the work procedures and workmanship of the Contractor but such observation will not relieve the contractor from responsibility for performance.

B. Warranty
The Contractor shall furnish a written warranty that describes the equipment supplied under these specifications will be free from defects of materials and workmanship for a period of fifteen years from the date of final acceptance unless otherwise specified and that all defects occurring within that period shall be corrected in a timely manner at no cost to the Owner.

C. Contractor's Qualifications
Contractor shall be required, before awarding of contract, to demonstrate to the complete satisfaction of the Engineer that he has the necessary facilities, ability and financial resources to execute the work in a satisfactory manner and within the time specified; that he has had experience in construction work as same or similar nature; that he has past history and references which will assure the Owner of his qualifications for executing the work.

Contractor shall submit a copy of a valid low-voltage license (Low-Voltage General, Low-Voltage Telecommunications or Low-Voltage Unrestricted as issued by the State Construction Industry Licensing Board of Low-Voltage Contractors).

Contractor shall submit a copy of a BICSI (Building Industry Consulting Service International) certified RCDD (Registered Communications Distributions Designer) certificate.

D. Comprehensive list of references
Attach a detailed list of references along with contact person, dates of work, mailing address, telephone numbers.

E. Contractor must provide proof of installation in a minimum of five sites using an enhanced Category 6e structured cabling with 100 or more active (working) nodes installed.

F. Data/Voice System Subcontractor shall submit a certification stating that he is an authorized representative for the manufacturer of the equipment he is submitting for approval and that he maintains a fully equipped and stocked service shop and shall respond to service within 12 normal working hours.

1.04 SCOPE OF WORK

A. Scope of Project Standards and Description

The cabling and wiring placed for voice and data communications on this undertaking shall be "Unshielded Twisted Pair" type and conform to the requirements contained in the latest editions of the National Electric Code (NEC) and the latest editions of the following American National Standards Institute (ANSI) specifications:

1. TIA/EIA 568-Commercial Building Telecommunications Wiring Standard
2. TIA/EIA 569-Commercial Building Standard for Telecommunications Pathways and Spaces
3. TIA/EIA 606-Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
4. TIA/EIA 607-Commercial Building Grounding and Bonding Requirements for Telecommunications
5. Addendums to TIA/EIA 568

B. Specifications for the Fiber Optic Backbone, Jacks and Outlets, Horizontal Wiring, Patch Panel, and Wall Mounted Racks are provided in this specification section.

1.05 GUARANTEES

A. All communication outlets wired and serviceable must be tested and certified in compliance with TIA/EIA 568-C.2-1 enhanced Category 6e specifications. Testing must be "end-to-end". Test results shall be forwarded to Engineer a minimum of one week prior to final inspection.

1.06 TESTING AND CERTIFICATION

A. Testing fiber optic and copper distribution systems are crucial in assuring the overall integrity and satisfactory performance of the network. Test results

quantify system quality, identify system faults, and establish the baseline accountability performance of the system. Proper testing also maximizes the longevity of the system, minimizes downtime and maintenance, and facilitates system upgrades or reconfiguration.

B. The Contractor shall provide proof of communications wiring systems certification and testing certification.

C. All data and voice wiring and terminations shall be tested and must pass TIA/EIA standards for enhanced Category 6e Cabling. All faults shall be corrected.

D. All test results must be printed and show the following primary results:

1. Wire map
2. Length
3. Insertion Loss
4. Near-end crosstalk (NEXT)
5. Power sum near end crosstalk (PSNEXT)
6. Equal-level far-end crosstalk (ELFEXT)
7. Power sum equal-level far-end crosstalk (PSELFEXT)
8. Return Loss
9. Propagation delay

1.07 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CommScope, Inc.
2. Berk-Tek; a Nexans company.
3. Corning Cable Systems.
4. General Cable Technologies Corporation.
5. Mohawk; a division of Belden CDT.
6. Superior Essex Inc.
7. Hellerman Tyton Connectivity Devices
8. Hitachi Cabling

B. Description: Multimode/Singlemode (See drawings. Coordinate with owner for exact specifications).

1. Basis-of-Design Product: Subject to compliance with requirements, provide CommScope Uniprise LazrSPEED 550 cabling or comparable product by one of the listed manufactures.

2. Comply with ICEA S-83-596 for mechanical properties.

3. Comply with TIA/EIA-568-B.3 for performance specifications.

4. Comply with TIA/EIA-492AAA-D for detailed specifications.

5. Comply with ISO 11801for OM4 performance, Laser-optimized 50 micrometer fibers with 4700 MHz.km EMB at 850 nm.

6. Comply with IEC 607 93-2-10 for TYPE A1a.3 performance, Laser-optimized 50 micrometer fibers with 4700 MHz.km EMB at 850 nm.

7. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

- Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
- Riser Rated, Nonconductive: Type OFNR, complying with UL 1666.

C. Jacket:

1. Jacket Color:
2. Aqua for multimode cable.
3. Yellow for singlemode cable
4. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
5. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

1.08 OPTICAL FIBER CABLE HARDWARE (AT MDF FIRST FLOOR AND IDF'S FLOORS 2-10)

A.Manufacturers: Subject to compliance with requirements, provide products by one of the following:
B.ADC.
C.American Technology Systems Industries, Inc.
D.Berk-Tek; a Nexans company.
E.Corning Cable Systems.
F.Dynacom Corporation.
G.Hubbell Premise Wiring.
H.Molex Premise Networks; a division of Molex, Inc.
I.Nordex/CDT; a subsidiary of Cable Design Technologies.
J.Optical Connectivity Solutions Division; Emerson Network Power.
K.Siemon Co. (The).

L.Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
M.Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

N.Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.

O.Cable Connecting Hardware:
P.Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
Q.Quick-connect, simplex and duplex, Type ST connectors. Insertion loss not more than 0.75 dB.
R.Type SFF connectors may be used in termination racks, panels, and equipment packages.

1.09 LOCAL AREA NETWORK (LAN) JACK AND OUTLET SPECIFICATIONS

A. Locations shown on drawings will be equipped with a consistent arrangement of LAN communications outlets.

B. Outlet faceplate for this arrangement shall be configured in the following fashion:

1. The jacks used shall fit properly in the outlet openings of the outlet faceplate. The jacks used shall conform to enhanced Category 6e parameters of TIA/EIA 568-C.2-1

a. In a properly installed enhanced Category 6e UTP cabling system, the jacks used shall be capable of supporting LAN data rates of 1000 Mbps.

b. The wiring arrangement of the jack shall conform to the TIA/EIA 568.

c. The jack shall possess the following characteristics:

1. The eight (8) position / eight (8) conductor jack shall be capable of supporting the previously defined data rates as well as voice (including ISDN).
2. Utilization of 110 type or equivalent insulation displacement hardware for horizontal wire attachment and acceptance of 22 or 24 AWG conductors.
3. The jack wires shall consist of 50 micro-inch lubricated gold plating over 100 micro-inch nickel underplating.

d. Any vacant faceplate position shall be reserved for future growth and should have a dust cover/blank inserted.

C. Acceptable Manufacturer's: Mod-Tap, Ortronics, AT&T, AMP, and Hubbell, Interlink, Leviton, Panduit, and Siemon.

D. Each jack shall have faceplate labeled. Also neatly label backside of faceplate with a permanent marker to note jack number.

E. Labeling of multiple drops in a common space shall be sequentially numbered. Numbers shall not be assigned randomly. Coordinate prior to terminating at racks, no exceptions.

F. See drawings for jacket color required.

G. For all Wireless Access Point drops, cabling shall be plenum rated Cat. 6A (augmented) cable. See drawings for additional information.

1.10 LOCAL AREA NETWORK (LAN) HORIZONTAL WIRING SPECIFICATIONS

A. This section covers the cable from the communications outlet to the patch panel in the MDF and all IDF wiring closets. These cables shall be Enhanced Category 6e Unshielded Twisted Pair cable. Each cable shall be placed in a "point-to-point" fashion from the work area outlet to the wiring closet for each communications outlet needed. There shall be no intermediate splices or cross connects in these cables.

B. The characteristics of the horizontal cable are as follows:
1. Enhanced Category 6e cable consisting of four pair of 23 AWG bare solid copper conductors insulated with a plenum rated material. The insulated conductors are tightly twisted into pairs and jacketed with plenum rated material. No type of shield is required in the sheath.
2. Each sheath shall contain four unshielded copper pairs. Each pair shall have a different twist per foot ratio ranging from 12 to 24 twists per foot. No more than 1/2" inch may be untwisted and the sheath may not be stripped back more than 1/2" inch at the jack during installation.
3. Cable shall have central crossweb to minimize crosstalk between pairs.

C. The cable component shall meet or exceed the following requirements:
   1. ASNI/TIA 568-C.2 "Commercial Building Telecommunications Standard, Part 2: Balanced Twisted-Pair Telecommunications Cabling and Components Standard"
   2. ASNI/TIA 1152 Requirements for Field Test Instruments and Measurements for Balanced Twisted Pair Cabling "
   3. Certified Enhanced Category 6e Cable under Third Party Cable Certification Program.
   4. ICEA S-102-700
   5. ANSI/ICEA S-102-732
   6. UL Standard 444
   7. National Electric Code - Article 800

D. Subject to compliance with specification requirements, the only acceptable Enhanced Cat-6e cables approved for use as follows:

   1. Mohawk Advancenet
   2. Hittachi HCM Premium series
   3. Belden Datatwist 3600
   4. General Cable Genspeed 6000
   5. Berk-Tek Lanmark 1000

E. Plenum rated cable shall be used. The plenum cable shall be composed of four pair of 23 gauge bare solid copper conductors insulated with a plenum rated insulation that is the same material configuration on all four pairs, 3+1 or 2+2 designs are not allowed. The insulated conductors are tightly twisted into pairs and jacketed with low smoke plenum rated PVC. It shall conform to a NEC Type CMP for plenum and NEC Type CMR for riser applications.

1.11 LOCAL AREA NETWORK (LAN) PATCH PANEL SPECIFICATIONS

A. This section covers the termination hardware located in the MDF and IDF (wiring closet). The termination hardware shall provide the capability to be able to patch connections between ports on the LAN hardware (electronics) and the horizontal cables.

B. The Patch panels shall be enhanced Category 6e Modular Jack Panels.

C. The termination hardware will be co-located on wall mounted racks with the LAN electronics (By others). The configuration of the patch panels shall be in an agreement that minimizes patch cord lengths. Provisions for cable management (organization of horizontal and vertical cable and patch cords) on the rack should be included.

D. Horizontal cables will be directly connected to 110 insulation displacement hardware or equivalent associated with each jack on the patch panel. The jacks on the patch panel shall be wired in accordance with TIA/EIA 568- B.2 standard.

E. Enhanced Category 6e, factory-built, manufacture tested patch cords shall be provided for each drop. Provide 10' patch cord at station end. Provide 3' or 5' patch cord at rack end. (Length as required for electronics to properly lace cords). Provide velcro patch cord wraps for cable management.

F. Fiber Termination requirements:

Fiber optics connections should be terminated using a rack mountable Interconnect enclosure or equivalent to insure that the connections are protected.

G. Acceptable Manufacturer's: Mod-Tap, Ortronics, AT&T, AMP, Hubbell, Interlink, Leviton, Panduit, and Siemon.

1.12 UNINTERRUPTIBLE POWER SUPPLY FOR NETWORK ELECTRONICS

A. A 2000VA rack mounted UPS shall be provided for wall cabinet rack on all 10 floors.

1.13 LOCAL AREA NETWORK (LAN) CABINETS AND RACKS SPECIFICATIONS

A. Racks: Communications racks shall be UL listed 7N69. All rack design shall be a structural aluminum construction, having 3-inch (76 mm) wide vertical rail channels.

Organizers and covers. Wall mounted rack to be of same series with minimum 18U height.

B. Acceptable equal Manufacturer are Mod-Tap, Ortronics, AT&T, AMP, Leviton, Interlink, Panduit, and Siemon.

1.14 SYSTEM DOCUMENTATION

A. As part of the wiring system installation, the Contractor shall provide detailed documentation of the distribution system to facilitate system administration, system maintenance and future system changes. This requirement includes as-built drawings with all cables and terminations identified, a bill of materials of all installed equipment and wiring, rack and backboard equipment layouts showing placement of support equipment, and model and serial numbers of all installed equipment. A clear and consistent nomenclature scheme is to be defined and used on the documentation and cable labeling which facilitates locating and identifying each cable.

B. System verification and acceptance documentation signed and dated by the installer (Contractor) and the design professional shall also be provided. This documentation shall include test measurements and system calibrations performed for the entire system. Sample system operations shall also be performed with actual hardware or using contractor provided test equipment and documented to verify that the system is operational and ready for acceptance. This shall also establish the baseline performance of the system.

1.15 TRAINING

A. Training of owner's personnel (a minimum of two) shall be provided. Training will cover the location nomenclature, documentation structure and contents, documentation maintenance procedures, a "walk-through" for location and labeling orientation, system reconfiguration using the MC, and IC-X facilities (Termination hardware, punch blocks, etc.).

B. Provide a record set plan noting drop locations and jack designations. As-built shall be a full size plan and shall be computer generated in AutoCAD format.

Provide a CD to Owner with (as-build) on disc at project closeout. At each rack provide a copy of (as-built) mounted on wall. Mount plan under plexiglass.

END OF SECTION

SECTION 270220

COMMUNICATIONS CONSTRUCTION REVIEWS, INSPECTION, AND TESTING

1.01 GENERAL

A. Comply with Division 1 - General Requirements.

1.02 CONSTRUCTION REVIEWS

A. The Architect or his representative shall observe and review the installation of all electrical systems shown on the drawings and as specified herein.

1.03 CONTRACTOR'S FINAL INSPECTION

A. At the time of the Contractor's final inspection, all systems shall be checked and tested for proper installation and operation by the Contractor in the presence of the Architect or his representative.

B. The Contractor shall furnish the personnel, tools and equipment required to inspect and test all systems.

C. Following is a list of items that the contractor must demonstrate to the Architect or his representative as complying with the plans and specifications. Please note that this list does not necessarily represent all items to be covered in the final inspection, but should give the Contractor an idea of what is to be reviewed.

1. Demonstrate that all devices are properly secured to boxes, that device plates are properly aligned and are not being used to secure device.

2. Demonstrate that Data/Voice Network cabling meets as testing and certifications as noted in section 27 0210.

4. Demonstrate that Fire Alarm System is in proper working order, and meeting all requirements outlined in specifications.

5. Contractor shall complete the following Certification of Completion/Testing on all Division 27 Systems.

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END OF SECTION 27 0220

SECTION 313116
SOIL TREATMENT / TERMITE CONTROL

PART ONE - GENERAL

RELATED DOCUMENTS

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

WORK INCLUDED

Procurement of chemicals and their application to all soil and earth-type material which will be covered by or lie immediately adjacent to new construction footings, foundations, and floor slabs so as to provide a lethal barrier to subterranean termites.

GENERAL REQUIREMENTS

Qualification of Contractor: All work shall be done by a bonded contractor who shall be a member of the Pest Control Association in state in which the work is being performed. He shall also demonstrate to the Architect proof of having been in the pest control business for a minimum of five (5) years.

Notification: The Contractor shall notify the Architect at the time of the soil treatment application and shall not proceed until the Architect can physically verify on site the rate of application and content of chemicals. The Contractor shall be prepared at the request of the Architect, to have samples of chemicals tested for content by an independent laboratory and shall pay all costs.

Warranty: Upon completion of the Work, and as a condition of its acceptance, deliver to the Architect two (2) copies of a Warranty signed by an authorized representative of the installing Subcontractor, and co-signed by the Contractor, agreeing:

To make an inspection of the Work once each year for a total period of five years following the Date of Substantial Completion for the purpose of detecting termite infestation;

If termite infestation is found during that five year period, to retreat in accordance with prevailing practices of the trade and within ten calendar days after such infestation is discovered;

To repair damage to the Work caused by subterranean termites during that five-year period, to a maximum cost of $5,000;

To make such inspections, retreatment, and repairs at no additional cost to the Owner.

PART TWO - PRODUCTS

CHEMICALS

Chemicals for Termite Treatment: To the extent approved by governmental agencies having jurisdiction, use working solutions containing any one of the following chemicals at the listed minimum concentration:

Premise Pro Termiticide/Insecticide, manufactured by Bayer Environmental Science. The active ingredient is Imidacloprid 42.8%.

Talstar Professional Termiticide/Insecticide, manufactured by FMC Corporation. The active ingredient is Bifenthrin 7.9%.

Termidor 80 WG Termiticide/Insecticide, manufactured by BASF Corporation. The active ingredient is Fipronil 80.0%.

If combinations of toxicants are approved by governmental agencies having jurisdictions, provide toxicants having the maximum strength so approved, at no additional cost to the Owner.

Chemicals for Pavement Treatment: Emulsion shall be Pramitol 25E herbicide as manufactured by Ciba-Geigy or approved equal. Chemical Concentration and Rate of Application: Apply chemical uniformly at the rate of 25 gallons per acre (0.66 fl. oz. per square yard) in minimum of 100 gallons of water.

PART THREE - EXECUTION

TIME OF APPLICATION

Do not apply chemicals when surface water is present, when soil is excessively wet or when rainfall is predicted as imminent. Chemicals shall be applied at least 12 hours prior to placing concrete and other materials which will be in contact with the treated materials.

APPLICATION OF TERMITE TREATMENT

Rate of Application of Termite Treatment: Begin soil poisoning only after all preparation for slab placement is complete.

Slabs on grade: Apply toxicant as an overall treatment at the minimum rate of one gallon of toxicant to each ten (10) square feet of area under slabs on grade within building lines including basement areas.

Utility entrances: Apply toxicant at the rate of two (2) gallons of toxicant per five (5) lin. ft. at critical locations where utilities pass through exterior walls and through floor slabs. Extend treatment not less than 48" from wall into trench.

Walls and Footings:

Apply toxicant at the rate of two (2) gallon toxicant per five (5) lin. ft. along both sides of all foundation walls, cross walls, and grade beams, after all nearby excavation has been completed.

Under foundations and footings, including horizontal and vertical surfaces of excavations, prior to pouring of concrete, at the rate of two (2) gallons per ten (10) square feet.

Apply toxicant at the rate of one (1) gallon of toxicant per five (5) lin. ft. to voids in masonry walls.

Miscellaneous: Apply toxicant at the rate of two (2) gallons of toxicant per five (5) lin. ft. at the following areas:

Immediately below expansion joints, control joints, and all areas where slab will be penetrated by construction.

Where exterior facings or veneers extend below grade level along the exterior side of all foundation walls.

Where unit masonry foundation construction is used.

At sidewalks abutting structures, limit treatment under pavement to a 2'-0" side strip adjacent to structure, at the rate of two (2) gallons per ten (10) square feet.

APPLICATION OF PAVEMENT TREATMENT

Chemicals shall be applied on finish grades at specified rates prior to installation of any surface material. The purpose of this work is to sterilize soil under new pavements so that grass and other vegetation will not deteriorate the new surface material.

END OF SECTION