

A NEW SENIOR WELLNESS CENTER

at

2829 W. Meighan Boulevard

for the

City of Gadsden, Alabama

Gadsden City Bid Request 3485

Sherman Guyton
Mayor

Prepared By:

THOMAS M. McELRATH, ARCHITECT
717 Merit Springs Road
Gadsden, Alabama 35901

BIDS RECEIVED BY:
Iva Nelson, City Clerk

Architect's Project No. 2022-01

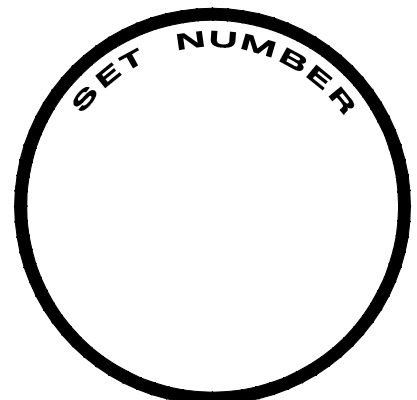
Date: September 15, 2022

PROJECT MANUAL



THOMAS M. McELRATH, ARCHITECT
ARCHITECTURE and SPACE PLANNING

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A NEW SENIOR WELLNESS CENTER
at
2829 W. Meighan Boulevard
for the
City of Gadsden, Alabama
Gadsden Bid Request No. 3485

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ADVERTISEMENT FOR CONSTRUCTION BIDS

A NEW SENIOR WELLNESS CENTER

at

2829 W. Meighan Boulevard

for

The City of Gadsden, Alabama

Gadsden Bid Request No. 3485

Sealed construction proposals will be received by the City Clerk, City of Gadsden, Alabama, at the City Hall, 90 Broad Street, Room 411, Gadsden, Alabama until 2:00 P.M., Thursday, October 6, 2022, for furnishing all labor, materials, equipment, and service required to complete Senior Wellness Center, Bid Request No. 3485, located in the City of Gadsden, Alabama.

Bids submitted prior to the bid opening by mail shall be directed to "City Clerk, P.O. Box 267, Gadsden, Alabama 35902-0267" or in person delivered to the office of the City Clerk, Room 401, City Hall, 90 Broad Street, Gadsden, Alabama. Bids will be publicly opened and read at the above time and place.

Bid Documents are open to the public for inspection at the City Hall, Room 301, City Hall, 90 Broad Street, Gadsden, Alabama, Alabama AGC / ISQFT Plan Room; Dodge Project Data; and Construct Connect. Electronic copies of Bid Documents may be obtained from the Architect through email request only. The same process is applicable to sub-contractors and vendors. No printed hard copies of bid documents will be issued. Requests for Bid Documents should be submitted to tom@tmm-architect.com. In order to submit a bid, all General Contractor bidders must use the procedures above to procure Bid Documents and having done so, will be placed on the Architect's Official Bidders List. Bids received from bidders who obtained Bid Documents through any other method and are not on the Architect's Official Bid List will be rejected.

A Mandatory Attendance Pre-Bid Meeting will be held at 2:00 p.m., Thursday, September 29, 2022 at the office of the Director of Engineering, Gadsden City Hall, Room 301. All General Contractor Bidders expecting to submit a bid shall have a knowledgeable representative present at this meeting.

A Cashier's Check (drawn on an Alabama bank) or Bid Bond for 5% of the amount bid (maximum of \$10,000) and made payable to the City of Gadsden, Alabama must accompany each bid as evidence of good faith. It is not required that a contractor be licensed in order to submit a bid; however, prior to award of a contract, proper proof of all applicable licensures must be provided by the contractor, proof of insurance coverages of the types and amounts as set forth in the project specifications will be required of the contractor, and any and all subcontractors, prior to beginning work. The contractor will be required to perform work amounting to at least 30% of the total contract cost with its own organization.

This is a Federally Funded Project. The proposed work shall be performed in conformity with the rules and regulations for carrying out the Federal Highway Act and other acts amendatory, supplementary, or relative thereto. The project is subject to the Contract Work Hours and Safety Standards Act and its implementing regulations. MBE/DBE participation is encouraged; however, no specific MBE/DBE goals have been established for this project.

Minimum wage rates (Davis Bacon Act) for this project have been pre-determined by the Secretary of Labor and are set forth in the advertised specifications.

In accordance with TITLE 49, Code of Federal Regulations, all bidders are hereby notified that it will be affirmatively ensured that in the contract entered into pursuant to this advertisement, minority business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, religion, sex or national origin in consideration for an award.

The successful bidder will be required to furnish and pay for the satisfactory Performance and Payment Bond or Bonds in the amount required by Section 39-1-1(a), Code of Alabama 1975, and evidence of insurance as required by the bid documents within ten (10) days after being notified that he has been awarded the contract.

No bidder may withdraw his bid within six (60) days after the actual date of the opening thereof. The bidder must comply with all requirements of the public works bid law Section 39-2-1 et seq., Code of Alabama 1975.

The right to reject any or all bids and to disregard any minor irregularities is reserved by the owner.

Any bidder, whether a resident or non-resident of the State of Alabama, must comply with all applicable provisions of Section 34-8-1, et. seq., Code of Alabama, 1975, including requirements for licensing as a general contractor and the necessity to show evidence of license, before the bid will be considered by the awarding authority. A current license number must be included on the bid or a statement that is has been applied for.

Bidders must comply with the President's Nos. 11246 and 11375 which prohibit discrimination in employment regarding race, creed, color, sex, or national origin. Bidders must also comply with Title IV of the Civil Rights Act of 1964, Title VIII of the Civil Rights Act of 1968, and Section III of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u.

By signing this contract, the contracting parties affirm, for the duration of the agreement, that they will not violate federal immigration law or knowingly employ, hire for employment, or continue to employ an unauthorized alien within the state of Alabama. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom.

Bidders must certify that they do not and will not maintain or provide for their employees any facilities that are segregated on a basis of race creed, color, sex, or national origin. Bidders must also certify they will make facilities handicap accessible to the extent required by law.

THE CITY GADSDEN, ALABAMA
Sherman Guyton, Mayor

THOMAS M. McELRATH, ARCHITECT
Thomas M. McElrath, Principal

Iva Nelson, City Clerk

TO (OWNER): PROJECT: APPLICATION NO: Distribution to:
 FROM (CONTRACTOR): VIA (ARCHITECT): ARCHITECT'S PROJECT NO: ☐ OWNER
☐ ARCHITECT
☐ CONTRACTOR
 CONTRACT FOR: CONTRACT DATE:

CONTRACTOR'S APPLICATION FOR PAYMENT

CHANGE ORDER SUMMARY		
Change Orders approved in previous months by Owner	ADDITIONS	DEDUCTIONS
TOTAL		
Approved this Month		
Number Date Approved		
TOTALS		
Net change by Change Orders		

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising the above application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief, the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

Application is made for Payment, as shown below, in connection with the Contract. Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM \$ _____
2. Net change by Change Orders \$ _____
3. CONTRACT SUM TO DATE (Line 1 + 2) \$ _____
4. TOTAL COMPLETED & STORED TO DATE \$ _____
(Column G on G703)
5. RETAINAGE:
 - a. ____ % of Completed Work \$ _____
(Column D + E on G703)
 - b. ____ % of Stored Material \$ _____
(Column F on G703)
 Total Retainage (Line 5a + 5b or
 Total in Column I of G703) \$ _____
6. TOTAL EARNED LESS RETAINAGE \$ _____
(Line 4 less Line 5 Total)
7. LESS PREVIOUS CERTIFICATES FOR
 PAYMENT (Line 6 from prior Certificate) \$ _____
8. CURRENT PAYMENT DUE \$ _____
9. BALANCE TO FINISH, PLUS RETAINAGE \$ _____
(Line 3 less Line 6)

State of: _____ County of: _____
 Subscribed and sworn to before me this _____ day of _____, 19____
 Notary Public:
 My Commission expires: _____

AMOUNT CERTIFIED \$ _____
 (Attach explanation if amount certified differs from the amount applied for.)
 ARCHITECT:

By: _____ Date: _____
 This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

AIA DOCUMENT G703 (Instructions on reverse side) PAGE OF PAGES

APPLICATION NUMBER:

APPLICATION DATE:

PERIOD TO:

ARCHITECT'S PROJECT NO:

[illegible]

INVENTORY OF STORED MATERIALS

Project:

For Estimate No. _____

For Period Ending _____

Contractor:

Project No. _____

[illegible]

To be used as documentation to support value of Stored Materials reported on APPLICATION AND CERTIFICATE FOR PAYMENT.

Page ____ of ____

PROGRESS SCHEDULE AND REPORT	CONTRACTOR: ARCHITECT: 	DATE OF REPORT
PROJECT _____		PROCEED DATE
_____		PROJECTED COMPLETION DATE

WORK DIVISION	%	AMOUNT													
1. GENERAL REQUIREMENTS															
2. SITEWORK															
3. CONCRETE															
4. MASONRY															
5. METALS															
6. WOOD AND PLASTIC															100%
7. THERMAL AND MOISTURE PROTECTION															90%
8. DOORS AND WINDOWS															80%
9. FINISHES															70%
10. SPECIALTIES															60%
11. EQUIPMENT															50%
12. FURNISHINGS															40%
13. SPECIAL CONSTRUCTION															30%
14. CONVEYING SYSTEMS															20%
15. MECHANICAL															10%
16. ELECTRICAL															0%
TOTAL ORIG. CONTRACT	100%														
ANTICIPATED DRAW IN \$1,000															
ACTUAL DRAW IN \$1,000															

LEGEND:

ANTICIPATED ACTIVITY

ACTUAL ACTIVITY

ANTICIPATED CASH FLOW

ACTUAL CASH FLOW

USE ADDITIONAL SHEETS IF JOB IS
SCHEDULED MORE THAN 12 MONTHS

PRIOR APPROVAL

1. **SUBSTITUTIONS**: Prior approval shall be required for proposed substitutions for equals to items as specified in these Specifications. Bidders shall submit written requests at least ten (10) calendar days before the opening of bids for general contract. Requests received after this time shall not be considered. Request shall clearly describe the product for which approval is asked, including all data necessary to demonstrate acceptability. Base request shall also include a confirmation that product will be ready for delivery to job site in accordance with the need of general contractor or sub-contractors. If the substitution is acceptable, the Architect shall approve the product in an Addendum.
2. **SUBMISSION**: Following is a form to be used for submission of request to Architect for approval of substitutes and/or unspecified products. Submission shall be made on bidder's letterhead and submitted to Architect. Make separate submission for each substitute item.

REQUEST FOR PRIOR APPROVAL OF SUBSTITUTE

Project No. **2022-01**
Title: **A NEW SENIOR WELLNESS CENTER**
at
2829 W. Meighan Boulevard
for
The City of Gadsden, Alabama
Gadsden Bid Request No. 3485

Location: **Gadsden, Alabama**

Bidders License No. _____ (If applicable)

Specifications or Drawings Reference: Section No. _____ Page No. _____

Paragraph _____ Drawing No. _____

Specified Item: _____

Submitted Item: _____

List of three installations:

1. _____

2. _____

3. _____

(Give Project Name and Location) _____

State differences between specified item and submitted item, if any:

Signed: _____ Date: _____

END

ASBESTOS-FREE CERTIFICATION
PROJECT
A NEW SENIOR WELLNESS CENTER
at
2829 W. Meighan Boulevard
for
The City of Gadsden, Alabama
Gadsden Bid Request No. 3485

Upon completion of this construction provide three (3) original copies of this form transmitting two (2) directly to the Owner by certified mail and one (1) to the Project Architect. This action shall be taken prior to request for final payment.

I, _____
hereby certify that the construction known as _____

_____ does not contain friable or non-friable asbestos and that any removal and/or abatement conducted during this project was done so in accordance with all required ordinances, regulations and mandates as required by law.

Contractor _____

Principal Officer (signature) _____

Principal Officer (typed name and title) _____

Sworn and subscribed before me this _____ day of _____, 20____.

_____ L.S.

My Commission expires _____

FORM OF ADVERTISEMENT OF COMPLETION

LEGAL NOTICE

In accordance with Chapter 1, Title 39, Code of Alabama, 1975, notice is hereby given that

(Contractor)

Contractor, has completed the Contract for Construction of

A NEW SENIOR WELLNESS CENTER

at

2829 W. Meighan Boulevard

for

The City of Gadsden, Alabama

Gadsden Bid Request No. 3485

at

(Insert location in County or City)

for the City of Gadsden, Alabama, 90 Broad Street, Gadsden, Alabama, Owner, and have made request for final settlement of said Contract. All persons having any claim for labor, materials, or otherwise in connection with this project should immediately notify:

Thomas M. McElrath, Architect, 717 Merit Springs Road, Gadsden, Alabama 35901

(Architect)

(Contractor)

(Business Address)

Note: This notice must be run once a week for four (4) successive weeks or, for projects of less than \$20,000.00, run one (1) time only. Proof of publication is required.

GENERAL CONTRACTOR'S ROOFING GUARANTEE

--

Project Name & Address	Project Owner(s) & Address

General Contractor's Name, Address, & Telephone Number	EFFECTIVE DATES OF GUARANTEE
	Date of Acceptance:
	Date of Expiration:

1. The General Contractor does hereby certify that the roofing work included in this contract was installed in strict accordance with all requirements of the plans and specifications and in accordance with approved roofing manufacturer's recommendations.
2. The General Contractor does hereby guarantee the roofing and associated work including but not limited to all flashing and counter flashing both composition and metal, roof decking and/or sheathing; all materials used as a roof substrate or insulation over which roof is applied; promenade decks or any other work on the surface of the roof; metal work; gravel stops and roof expansion joints to be absolutely watertight and free from all leaks, due to faulty or defective materials and workmanship for a period of five (5) years, starting on the date of substantial completion of the project. This guarantee does not include liability for damage to interior contents of building due to roof leaks, nor does it extend to any deficiency which was caused by the failure of work which the general contractor did not damage or did not accomplish or was not charged to accomplish.
3. Subject to the terms and conditions listed below, the General Contractor also guarantees that during the Guarantee Period he will, at his own cost and expense, make or cause to be made such repairs to, or replacements of said work, in accordance with the roofing manufacturers standards as are necessary to correct faulty and defective work and/or materials which may develop in the work including, but not limited to: blisters, delamination, exposed felts, ridges, wrinkles, splits, warped insulation and/or loose flashings, etc. in a manner pursuant to the total anticipated life of the roofing system and the best standards applicable to the particular roof type in value and in accordance with construction documents as are necessary to maintain said work in satisfactory condition, and further, to respond on or within three (3) calendar days upon proper notification or leaks or defects by the Owner or Architect.

- A. Specifically excluded from this Guarantee are damages to the work, other parts of the building and building contents caused by: (1) lightning, windstorm, hailstorm and other unusual phenomena of the elements; and (2) fire. When the work has been damaged by any of the foregoing causes, the Guarantee shall be null and void until such damage has been repaired by the General Contractor, and until the cost and expense thereof has been paid by the Owner or by the responsible party so designated.
- B. During the Guarantee Period, if the Owner allows alteration of the work by anyone other than the General Contractor, including cutting, patching and maintenance in connection with penetrations, and positioning of anything on the roof, this Guarantee shall become null and void upon the date of said alterations. If the owner engages the General Contractor to perform said alterations, the Guarantee shall not become null and void, unless the General Contractor, prior to proceeding with the said work, shall have notified the Owner in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate the work, thereby reasonably justifying a termination of this Guarantee.
- C. Future building additions will not void this guarantee, except for that portion of the future addition that might affect the work under this contract at the point of connection of the roof areas, and any damage caused by such addition. If this contract is for roofing of an addition to an existing building, then this guarantee covers the work involved at the point of connection with the existing roof.
- D. During the Guarantee period, if the original use of the roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray cooled surface, flooded basin, or other use of service more severe than originally specified, this Guarantee shall become null and void upon the date of said change.
- E. The Owner shall promptly notify the General Contractor of observed, known or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the General Contractor to inspect the work, and to examine the evidence of such leaks, defects or deterioration.

IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, 20_____.

General Contractor's Authorized Signature

Typed Name and Title

TITLE SHEET

CIVIL

SURVEY

C1.0	OF	15	DEMOLITION PLAN
C2.0	OF	15	SITE PLAN
C3.0	OF	15	GRADING PLAN
C4.0	OF	15	STORM PLAN
C5.0	OF	15	UTILITY PLAN
C6.0	OF	15	EROSION CONTROL PLAN
C7.0	OF	15	DETAILS
C7.1	OF	15	DETAILS
C7.2	OF	15	DETAILS
C7.3	OF	15	DETAILS
C7.4	OF	15	DETAILS
C7.5	OF	15	DETAILS
C7.6	OF	15	DETAILS
C7.7	OF	15	DETAILS
C7.8	OF	15	DETAILS

ARCHITECTURAL

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A2.2	OF	18	DIMENSIONS-FLOOR PLAN
A2.3	OF	18	REFLECTED CEILING PLAN
A3.0	OF	18	SCHEDULES AND DETAILS-SHEET ONE
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A4.0	OF	18	ELEVATIONS
A5.0	OF	18	ROOF PLAN
A5.1	OF	18	ROOF PLAN DETAILS
A6.0	OF	18	CROSS SECTIONS-SHEET ONE
A6.1	OF	18	CROSS SECTIONS-SHEET TWO
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A7.1	OF	18	WALL SECTIONS – SHEET TWO
A7.2	OF	18	WALL SECTIONS – SHEET THREE
A8.0	OF	18	LARGE SCALE PARTIAL PLANS & SCHEDULES
A8.1	OF	18	INTERIOR ELEVATIONS

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S1.1	OF	06	GENERAL NOTES
S2.0	OF	06	FOUNDATION & FLOOR PLAN
S2.1	OF	06	ROOF FRAMING PLAN
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S7.0	OF	06	SECTIONS

PLUMBING

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MECHANICAL

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M0.5	OF	09	MECHANICAL OSA CALCULATIONS
M0.6	OF	09	MECHANICAL OSA CALCULATIONS
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ELECTRICAL

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E2.0	OF	10	FLOOR PLAN-POWER
E3.0	OF	10	FLOOR PLAN-M&P CONNECTIONS
E4.0	OF	10	SITE PLAN-ELECTRICAL

END OF SCHEDULE OF DRAWINGS

SPECIFICATIONS & CONTRACT DOCUMENTS

SENIOR WELLNESS CENTER

BID REQUEST NO. 3485

CITY OF GADSDEN, ALABAMA

SEPTEMBER , 2022

***SHERMAN GUYTON
MAYOR***

***HEATH WILLIAMSON
DIRECTOR OF ENGINEERING***

***PREPARED BY:
CITY OF GADSDEN
ENGINEERING DEPARTMENT***

***BIDS RECEIVED BY:
IVA NELSON
CITY CLERK***

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DIVISION 102

INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

102.1 PROPOSALS

a. All bidders must be registered with the City of Gadsden Engineering Department in order to submit a bid. Bids received from unregistered bidders will be rejected.

b. All prime contractors that intend to submit a bid must be registered with the Engineering Department to be considered for award. All bids shall be submitted on forms prepared by the Owner, and shall be subject to all requirements of the Standard Specifications, project drawings and the instructions to prospective bidders. In the event of a unit price contract, the Engineering Department will check the extension of each item given in the proposal and correct all errors or discrepancies. In case of an error in the extension of prices, the unit price shall govern. The total amount obtained by adding all of the products of the unit prices and the various estimated quantities listed in the proposal shall be the Contract bid price. The unit prices shall be in ink or typed, and any alteration or erasure on the bid proposal shall be initialed by the signer.

c. The proposal shall be properly signed by the bidder and the bid documents enclosed in an envelope, which shall be sealed and clearly labeled with the words, "BID DOCUMENTS", the PROJECT NAME, the Gadsden BID NUMBER, the NAME AND ADDRESS OF THE BIDDER, and the BIDDER'S STATE OF ALABAMA CONTRACTOR'S LICENSE NUMBER OR A STATEMENT THAT IT HAS BEEN APPLIED FOR. Any bids not so marked on the envelope with the contractor's license number will not be opened. The date and time for receiving bids should be shown on the envelope to guard against the premature opening of any bid.

d. The Owner may not consider any bid which is not submitted on a bid form supplied by the Engineering Department, or altered in any way.

e. The Contract shall be awarded based upon the completion of the work according to the Specifications and drawings, together with all addenda thereto, of the lowest responsive proposal submitted by a responsible contractor. The Owner reserves the right to waive any informalities or reject any and all bids. The bidder

is required to submit only his lowest proposal for the work to be performed.

f. Documents required to be submitted follows in order to be deemed a responsible bid:

1. Bid Form
2. Bid Bond
3. Non-Collusion Affidavit of Prime Bidder
4. Equal Opportunity Report Statement
5. Wage, Labor, and Equal Employment Opportunity
6. Local Public Agency/Federal Funded Project Section.
7. Bidders List of Quoters

102.2 INTERPRETATIONS

No oral interpretation will be made to any bidder as to the meaning of the Specifications including the drawings. Every request for such an interpretation shall be made in writing to the owner at the address shown in the Invitation for Bids. Any inquiry received four (4) or more days prior to the date fixed for opening of bids will be given consideration. Every interpretation made to a bidder will be in the form of an addendum to the specifications which, if issued, will be on file in the office of the City Engineer of the City of Gadsden, Alabama until such time that the bids are opened. In addition, addenda will be sent to the email on file of each bidder, but it shall be the bidder's responsibility to make inquiry as to addenda issued. All such addenda shall become part of the Contract and all bidders shall be bound by such addenda, whether or not received by the bidders.

102.3 ALTERNATE BIDS

The proposal does not include an alternate bid.

102.4 BID SECURITY

a. The bid must be accompanied by a bid guaranty which shall be equal to the lesser of five percent (5%) of the amount of the bid or ten thousand dollars (\$10,000), and at the option of the bidder, may be a cashiers check or a bid bond secured by a guaranty company or a surety company in the

INSTRUCTIONS TO BIDDERS

form attached. No bid will be considered unless it is so guaranteed. Cashiers checks must be made payable to the order of the Owner. Cash deposits will not be accepted. The bid guaranty shall insure the execution of the contract and the furnishing of performance and payment bond or bonds by the successful bidder all as required by the Specifications.

b. In case bid security is in the form of a cashiers check, the Owner may take such disposition of the same as will accomplish the purpose for which submitted. Cashiers checks of unsuccessful bidders will be returned as soon as practicable after the opening of bids.

102.5 COLLUSIVE AGREEMENTS

a. Each person submitting to the Owner a bid for any portion of the work contemplated by the bidding documents shall execute an affidavit in the form herein provided, to the effect that he has not colluded with any other person, firm or corporation in regard to any bid submitted. Such affidavit shall be attached to the bid.

b. Each person submitting a bid for any subcontractor work shall submit to the contractor an affidavit in the form provided in Division 105.

c. Failure on the part of any bidder for either the prime contract or subcontracts to observe these provisions shall be cause for rejection of his bid.

102.6 CORRECTIONS

Erasures or alterations in the unit prices or other items of the proposal must be initialed by the bidder.

102.7 TIME FOR RECEIVING BIDS

a. Bids received prior to the time of opening will be securely kept, unopened. The officer whose duty it is to open them will decide when the specified time has arrived, and no bid received thereafter will be considered. No responsibility will be attached to an officer for premature opening of a bid not properly addressed or

identified. This type of bid may not be considered.

b. Bidders are cautioned to allow ample time for transmittal of bids by mail or otherwise. Bidders should secure correct information relative to the probable time of arrival and distribution of mail at the place where bids are to be opened.

102.8 OPENING OF BIDS

At the time and place fixed for the opening of bids, every bid received within the time fixed for receiving bids will be opened and publicly read aloud, irrespective of any irregularities therein. Bidders and other persons properly interested may be present, in person or by representative.

102.9 WITHDRAWAL OF BIDS

Bids may be withdrawn on written request dispatched by the bidder in time for delivery in the normal course of business prior to the time fixed for opening, provided that written confirmation of such withdrawal over the signature of the bidder is received by the bid officer prior to the time set for bid opening. Negligence on the part of the bidder in preparing his bid confers no right of withdrawal or modification of his bid after such bid has been opened. No proposal can be withdrawn, modified, or corrected after the hour set for opening the bids.

**102.10 AWARD OF CONTRACT;
REJECTION OF BIDS**

a. The Contract will be awarded to the responsible bidder submitting the lowest proposal complying with the conditions of the Invitation for bids provided his bid is reasonable and it is to the interest of the owner to accept it. The bidder to whom the award is made will be notified at the earliest practicable date. The Owner, however, reserves the right to reject any and all bids and to waive any informality in bids received whenever such rejection or waiver is in the interest of the Owner.

INSTRUCTIONS TO BIDDERS

b. The Owner also reserves the right to reject the bid of any bidder who has previously failed to perform properly, or to complete contracts on time, who is not in a position to perform the contract, or who has disregarded his obligations to subcontractors, material men or employees. In determining the lowest responsible bidder, the following elements, in addition to those mentioned above, will be considered; whether the bidder involved (1) maintains a permanent place of business; (2) has adequate plant equipment available to do the work properly and expeditiously; (3) has suitable financial resources to meet the obligations incident to the work; (4) has appropriate technical experience; (5) has defaulted under previous contracts; (6) has failed to pay or settle bills due for labor and material on former contracts in force at the time of issuance of proposals.

c. The ability of a bidder to obtain a performance bond shall not be regarded as the sole test of such bidder's competency or responsibility.

102.11 PERFORMANCE BONDS AND LABOR AND MATERIAL BOND, EXECUTION OF CONTRACT

a. Subsequent to the award, the successful bidder shall execute and deliver to the Owner a contract in the form included in the specifications in such a number of counterparts as the Owner may require. The contract shall be delivered to the Owner within the time limit specified, not to exceed ten (10) days after the instrument is submitted to the contractor for signature. Separate contract forms, in lieu of those found in these specifications, shall be used for submittal to the Owner.

b. After satisfying all conditions required for awarding the contract, as set forth in these documents, the successful bidder shall, within ten days, furnish a Performance Bond on the form included in the proposal in an amount equal to one hundred percent (100%) of the contract bid price of the contract as awarded. The successful bidder shall also furnish a Labor and Material Bond in an amount not less than 100% of the contract bid price, with the obligation that the contractor shall within ten days make payment to all persons, firms or corporations to whom the contractor may

become legally indebted for labor, materials, services and equipment used in the prosecution of the work, or for the payment of reasonable attorney's fees incurred by successful claimants or plaintiffs in suits on said bonds.

c. The failure of the successful bidder to properly execute the Contract and to supply the required bonds in accordance with the requirements of Section 102.12 a., b., and c shall constitute a default, and the Owner may, at its pleasure, award the Contract to the next responsible bidder or re-advertise for bids; and may charge against the initial bidder the difference between the amount of the bid and the amount for which a contract for the identical work is subsequently executed.

102.13 DAVIS-BACON ACT

Davis-Bacon Act requirements shall be in effect for this project. The contractor shall be required to submit weekly certified payrolls to the city and a representative of the city shall conduct interviews for proof of compliance. The contractor shall do all reporting required by this act. The rates to be used are provided in this specification booklet.

DIVISION 103

BID SPECIFICATIONS

BID FORM

BID NO. 3485 FOR THE **SENIOR WELLNESS CENTER** FOR THE CITY OF GADSDEN, ALABAMA. THE PROJECT SHALL BE BID IN ACCORDANCE WITH THE BREAKDOWN FOR THE ITEMS SHOWN BELOW AND ON PROJECT PLANS.

TO: The City of Gadsden
P.O. Box 267
City Hall
Gadsden, Alabama 35902-0267
Attn.: City Clerk

City Officials:

103.1 The undersigned, having examined and become familiar with the local conditions affecting the cost of the work and with the Specifications (including Invitations for Bids, Instructions to Bidders, This Bid, the Form of Bid Bond, Statements of Bidder's Qualifications and Form of Contract, the Form of Non-Collusion Affidavit, the Form of Performance Bond and Labor and Material Bond and the Technical Specifications) and the drawings and addenda numbered _____ to _____, as prepared by the City of Gadsden Engineering Department, Gadsden, Alabama, and on file in the office of the Director of Engineering of the City of Gadsden, Alabama, The Civic Hall, Gadsden, Alabama, hereby proposes to furnish all labor, materials, equipment, and services required to construct and complete "**SENIOR WELLNESS CENTER**". Due to the nature of work on this project, all items of work will be let in one contract or as separate proposals, whichever is applicable.

Senior Wellness Center

L.S. \$ _____

Please note bid number on outside of sealed envelope.

Note: Any alteration of the bid sheet may result in disqualification of the bid.

Note: Performance and Labor and Material Bond shall be based on the preceding total amount.

In submitting this bid, it is understood that the right is reserved by the City of Gadsden, Alabama to reject any and all bids. If written Notice of Acceptance of this bid is mailed to the undersigned within thirty (30) days after the opening thereof, or 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.

Company Name and Phone Number (Please Print or Type)

103.3 Security in the sum of

_____, Dollars (\$_____)
in the form of _____ is submitted herewith in accordance with the specifications.

103.4 Attached hereto is an affidavit that the undersigned has not entered into any collusion with any person in respect to this proposal or any other proposal or the submitting of proposal for the contract for which this proposal is submitted. Also attached is a statement of bidder's qualifications.

Date: _____

Contractor

OFFICIAL ADDRESS

By: _____

Title: _____

Ala. License No. _____

Federal Tax ID No. _____

Phone No. _____

Fax No. _____

Company Name and Phone Number (Please Print or Type)

BID BOND

KNOW ALL MEN BY THESE PRESENTS, That we the Undersigned

as PRINCIPAL, and

_____, as SURETY are held and firmly bound unto the City of Gadsden, Alabama herein-after called the "City of Gadsden", in the penal sum of _____ Dollars lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, 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 after the opening of the same, and shall within the period after the prescribed forms are presented to him for signature, enter into a written contract with the City of Gadsden 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 failure to enter into such contract and given such bond within the time specified, if the Principal shall pay the City of Gadsden, the difference between the amount specified in said bid and the amount for which the City of Gadsden 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 full force and virtue.

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 representatives, pursuant to authority of its governing body.

Company Name and Phone Number (Please Print or Type)

IN PRESENCE OF:

_____(SEAL)

Individual Principal

Business Address

_____(SEAL)

Individual Principal

Business Address

Attest:

Corporate Principal

Business Address

Attest:

By _____(SEAL)*

Corporate Surety

Business Address

By _____(SEAL)*

(Power of Attorney for person signing for surety company must be attached to bond.)

*Affix corporate seals.

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 said bond on behalf of the Principal was then
_____ of said corporation; that I know his signature, and his signature thereto is genuine;
and that said bond was duly signed, sealed, and attested to for and in behalf of said corporation by authority
of its governing body.

_____(SEAL)*

Company Name and Phone Number (Please Print or Type)

STATEMENT OF BIDDER'S QUALIFICATIONS

(General Contractor)

All questions must be answered and the date given must be clear and comprehensive. This statement must be notarized. **This information shall be submitted prior to award.**

1. Name of bidder.
2. State License #
3. Permanent main office address.
4. When organized.
5. Where incorporated.
6. How many years have you been engaged in the contracting business under your present firm name?
- 7.* Contracts on hand: (Schedule these, showing gross amount of each contract and the approximate anticipated dates of completion.)
- 8.* General character of work performed by your company.
- 9.* Have you ever failed to complete any work awarded to you? Please explain.
- 10.* Have you ever defaulted on a contract? Please explain.
- 11.* List the projects completed by your company within the last two years stating approximate cost for each, and the month and year completed.
- 12.* List your major equipment to be used on this contract.
- 13.* Background and experience of the principal members of your personnel, including the officers.
- 14.* Credit available; furnish written evidence.
- 15.* Financial statement no more than 60 days old.
16. Proof of enrollment in the E-Verify system.

*If necessary, attach separate sheets for these items.

NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

STATE OF _____

COUNTY OF _____

_____, being first duly sworn,
deposes and says that:

- (1) He is _____ of _____
(Owner or Partner or Officer) (Firm)
_____, The Bidder that has submitted the attached Bid;
- (2) He is fully informed respecting the preparation and contents of the attached Bid and of all circumstances respecting such Bid;
- (3) Such Bid is genuine and is not collusive or sham Bid;
- (4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed directly or indirectly with any other Bidder, firm or person to submit a collusive or sham bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the bid price or the Bid price of any other bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Local Authority or any person interested in the proposed Contract; and
- (5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

(Name of bidder if the bidder is an individual)
(Name of Partner if the bidder is a Partnership)
(Name of Officer if the bidder is a Corporation)

Subscribed and sworn to before me
this _____ day of _____, _____

(Notary Public)
My Commission Expires _____, _____

EQUAL OPPORTUNITY REPORT STATEMENT

The Bidder (Proposer) shall complete the following statement by checking the appropriate boxes.

* The Bidder (Proposer) has ____ has not ____ participated in a previous contract subject to the equal opportunity clause prescribed by Executive Order 10925, or Executive Order 11246.

* The Bidder (Proposer) has ____ has not ____ submitted all compliance reports in connection with any such contract due under the applicable filing requirements; and that representatives indicating submission of required compliance reports signed by proposed sub-contractors will be obtained prior to award of subcontracts.

If the Bidder (Proposer) has participated in a previous contract subject to the equal opportunity clause and has not submitted compliance reports due under applicable filing requirements, the Bidder (Proposer) shall submit a compliance report on Standard Form 100, "Employee Information Report EEO-1, Prior to the award of contract.

*NOTE: Failure to complete these blanks may be grounds for rejecting bid.

Name of Bidders

By _____

Title _____

Business Address: _____

Bidder's License No. _____

Contractor's License No. _____

WAGE, LABOR, AND EQUAL EMPLOYMENT OPPORTUNITY

CONTRACTORS CERTIFICATION OF NONSEGREGATED FACILITIES

It is hereby certified as a contractor on federally assisted projects that segregated facilities are not maintained or provided for company employees and employees are not permitted to perform their services at any location, under company control, where segregated facilities are maintained. It is agreed that a breach of this certification is a violation of the equal opportunity clause of this contract. As used in this specification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, 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 are, in fact segregated on the basis of race, color, religion, sex, or national origin because of habit, local custom or any other reason. It is agreed further that identical certifications will be obtained from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the equal opportunity clause, and that these certifications will be retained in the company files.

Date: _____

**LOCAL PUBLIC AGENCY
FEDERAL-AID FUNDED PROJECTS**

PLEASE READ AND COMPLETE SECTIONS A AND B. THE EXECUTION HEREINAFTER MADE ALSO CONSTITUTES THE EXECUTION OF THE PROPOSAL AND REPRESENTS THE AGREEMENT OF THE CONTRACTOR TO COMPLY WITH ALL DOCUMENTS CONTAINED IN THE PROPOSAL AND THOSE REFERRED TO THEREIN. FAILURE TO SUBMIT THE SWORN CERTIFICATION THROUGH PAGE 7 OF THIS NOTICE WILL BE CONSIDERED A NON-RESPONSIVE BID. BID BOND MUST BE SEPARATELY EXECUTED BY CONTRACTOR AND SURETY.

The contractor, subrecipient, or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of Federal-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:

- (1.) Withholding monthly progress payments;
- (2.) Assessing sanctions; and/or
- (3.) Disqualifying the contractor from future bidding as non-responsive.

The Statement Required To Be Submitted By Proposed Contractor Pursuant To Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246) and Regulations in 41 CFR Part 60-4 On All Federal and Federally-Assisted Contracts In Excess of \$10,000 Will Be Included In the Award of Your Contract and Should Be Returned With Your Executed Contract.

It is further agreed that if any provision of this contract shall contravene any statute or Constitutional provision or amendment, either now in effect or which may, during the course of this contract, be enacted, then that conflicting provision in the contract shall be null and void.

The undersigned understands that in the event the term of this contract includes more than one fiscal year, said contract is subject to termination should funds not be appropriated for the continued payment of the contract in subsequent fiscal years.

The undersigned understands that in the event of the proration of the fund from which payment under this contract is to be made, the contract will be subject to termination.

Section A: The Owner is obligated on every Federal-aid project to Implement, to the extent practical, 49CFR26, "Participation by Disadvantaged Business Enterprises (DBE) In U.S. DOT Financial Programs". This participation can be achieved by race neutral and/or race conscious means.

When race conscious means are used the contract goal for DBE participation will be Indicated on Page Two of the Proposal Cover Sheet and in Section 111 of the Alabama Department of Transportation Standard Specifications for Highway Construction. Race neutral participation occurs when the contractor exceeds the indicated contract goal, or in the absence of a contract goal, obtains participation from a certified DBE that meets the CREDIT TOWARD PARTICIPATION portion of Section 111 of the Alabama Department of Transportation Standard Specifications for Highway Construction.

If the Owner has determined that this project has sufficient opportunities for MBE/DBE participation the goal for this contract will be listed on Page Two of the Proposal Cover Sheet.

All bidders must complete form HR-DBE, "BIDDERS LIST OF QUOTERS FOR THE DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM."

If the contractor is low bidder for the project, it is understood the contractor will provide a DBE Utilization Plan which outlines the proposed percentage of DBE Utilization within five (5) calendar days of the letting date, along with documentation of the contractor's "Good Faith" efforts to utilize DBE firms if the proposed percentage of utilization is less than the designated project goal. The contractor's good faith efforts will fully comply with and meet all requirements, provisions and criteria of Title 49,

Code of Federal Regulations, Part 26, Including the criteria set forth in 49 CFR, Part 26, Appendix A and will comply with and meet the requirements, provisions and criteria set forth in Section 111 of the Alabama Department of Transportation

Standard Specifications for Highway Construction as all of such foregoing requirements, provisions and criteria are applicable to Disadvantaged Business Enterprises, all of which the contractor represents that he is familiar. The contractor understands that the good faith efforts of the contractor will be reviewed by the Owner in keeping with all such requirements, provisions and criteria.

NOTE

The Owner will advise the low bidder of his status as soon as possible after the opening of bids. A copy of the Owner's DBE Utilization form has been attached to this proposal for use in complying with the Requirement.

Failure by the successful bidder to provide an acceptable DBE Utilization plan within the time frame required or failure of the successful bidder to make and document Good Faith Efforts, when applicable, will result in non- award of the contract to that bidder. If the contract is awarded to the next low bidder, the original low bidder will be prohibited from doing any work on the contract, either as subcontractor or in any other capacity. The original low bidder will also be prohibited from bidding on the project if it is re-advertised for letting. These restrictions shall apply to any other name under which the same person, individual, partnership, company, firm, corporation, association, co-operative or other legal entity that may be operating in which the principal owner(s) is involved.

Section B: CONTRACTOR'S CERTIFICATION

The contractor proposes to perform all "Force Account of Extra Work" that may be required on the basis provided in the Specifications hereto attached, and to give such work personal attention in order to see that it is economically performed.

The contractor further proposes to execute the Contract Agreement in a form to be attached as soon as the work is awarded to the contractor and to begin and complete the work within the respective time limit provided for
In the Specifications hereto attached.

The contractor also proposes to furnish a Performance Bond, acceptable to the Owner, in an amount equal to the total amount of the contract. This bond shall serve not only to guarantee the completion of the work but also
to guarantee the excellence of both workmanship and materials until the work is finally accepted. The contractor will also furnish a materialsman bond, acceptable to the Owner, equal to the amount of the contract.

The contractor encloses a cashier's check or bid bond for five percent (5%) of the bid, maximum \$10,000.00, and hereby agrees that In case of failure to execute a contract and furnish bonds within fifteen (15) days* after notice of award, "the awarding authority shall retain from the proposal guaranty, if it is a cashier's check, or recover from the principal and/or the sureties, if the guaranty is a bid bond, the difference

between the amount of the Contract as awarded and the amount of the proposal of the next lowest acceptable bidder, which amount shall not exceed \$10,000.00.

If no other bids are received, the full amount of the proposal guaranty shall be so retained and/or recovered as Liquidated Damages for such default. It is understood that in case the work is not awarded to the contractor, the proposal guaranty, if a cashier's check, will be returned as provided in the Alabama Department of Transportation Standard Specifications for Highway Construction.

In compliance with State of Alabama Act 2016-312, the contractor further certifies that it is not currently engaged in, and will not engage in, the boycott of a person or an entity based in or doing business with a jurisdiction with which this state can enjoy open trade.

1. DISADVANTAGED BUSINESS ENTERPRISES

The contractor intends to comply with the contract documents to utilize Disadvantaged Business Enterprises (hereinafter referred to at times as (DBE)) to the extent practical and when, under Section A herein above, the contract documents specify a minimum monetary amount to be expended with Disadvantaged Business Enterprises, to equal or exceed said amount through subcontracting and/or by purchases of materials and services on the project.

It is understood that failure to submit a Disadvantaged Business Enterprise Plan, when such is required by the contract within the time frame so specified, will be cause for assessment of penalties as provided in the contract.

*Time may be modified by Special Provision.

It is further understood that failure to comply with the contract relating to Disadvantaged Business Enterprises, when such are applicable, will be cause for the assessment of penalties as provided in the contract.

2. REQUIREMENT BY THE EQUAL EMPLOYMENT OPPORTUNITY REGULATIONS OF THE SECRETARY OF LABOR (41 CFR 60-1.7(b) (1))

THE CONTRACTOR MUST CHECK THE APPROPRIATE BOX BELOW:

The contractor submitting this proposal certifies that such contractor

Has/____/ Has not/____/

participated in a previous contract or subcontract subject to the Equal Opportunity Clause, as required by Executive Orders 10925, 1114 or 11246.

If the contractor checked the "HAS" box above, the following statement must be completed. The contractor submitting this proposal certifies that such contractor

Has/____/ Has not/____/

filed with the Joint Reporting Committee, the director of OFCC, any Federal Agency or the former President's Committee on Equal Employment Opportunity all reports due under the applicable filing requirements of those organizations. All reports due are considered to be those requested by one of these committees or agencies,

Page 4 of 7

Concurrently, Standard Form 100 (EE0-1) is the only report required by the Executive Orders or their implementing regulations.

Proposed prime contractors and subcontractors who have participated in a previous contract or subcontract subject to the Executive Orders and who have not filed the required reports should note that 41 CFR 60-1.7(b)(1) prevents the award of contracts and subcontracts unless such contractor submits a report covering the delinquent period or such other period specified by the Federal Highway Administration or by the director, Office of Federal Contract Compliance, U.S. Department of Labor.

3. COLLUSION

It is further certified that neither the person, firm, partnership or corporation submitting this bid, nor any of their officers, have directly or indirectly entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this contract.

4.SUSPENSION/DEBARMENT

Certification Regarding Debarment, Suspension and Other Responsibility Matters - Primary Covered Transactions

Instructions for Certification

By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

The inability of a person to provide the certification required below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the Owner's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such person from participation in this transaction.

The certification in this clause is a material representation of fact upon which reliance was placed when the Owner determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the Owner may terminate this transaction for cause of default.

The prospective primary participant shall provide immediate written notice to the Owner to whom this proposal is submitted if at any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

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 meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549,

The prospective primary 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 debarred, suspended, declared ineligible *or* voluntarily excluded from participation in this covered transaction, unless authorized by the Owner entering into this transaction.

The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion/Lower-Tier

Covered Transactions," provided by the Owner entering into this covered transaction, without modification, in all lower-tier covered transactions and in all solicitations for lower-tier covered transactions,

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 debarred, suspended, ineligible or voluntarily excluded from the covered transaction, 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 Nonprocurement List.

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.

Except for transactions authorized under these instructions, if a participant in a covered transaction knowingly enters into a lower-tier covered transaction with a person who is suspended, debarred, ineligible or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the Owner may terminate the transaction for cause or default.

Certification Regarding Debarment Suspension and other Responsibility Matters-Primary Covered Transactions The prospective primary participant certifies, to the best of its knowledge and belief, that it and its principals:

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

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

Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in the preceding paragraph of this certification; and have not within a three-year period preceding the application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

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

B. For Lower-Tier Requirements, see Section XI of "Required Contract Provisions Federal-Aid Construction Contracts" located in the proposal.

Exceptions to the above are to be submitted on a separate sheet with the bid proposal. For any exception noted, indicate to whom it applies, initiating agency and dates of action. Providing false information may result in criminal prosecution or administrative sanctions.

5.LOBBYING RESTRICTIONS

Page 6 of 7

These restrictions were established by Section 319 of Public Law 101-121 (Department of the Interior and Related Agencies Appropriations Act for Fiscal Year 1990).

The contractor certifies to the best of his/her knowledge and belief that:

A. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress in connection with 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 and the extension, continuation, renewal, amendment or modification of any Federal contract grant, loan or cooperative agreement.

B. If any funds other than 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 Federal agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress in connection with this Federal contract, grant, loan or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, 'Disclosure Form to Report Lobbying,' in accordance with its instructions.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file this required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The contractor also agrees by submitting this proposal that he/she shall require that the language of this certification be included in all lower-tier subcontracts which exceed \$100,000 and that all such subrecipients shall certify and disclose accordingly.

I further certify that I am a properly authorized individual or corporate official, as applicable, to make this certification that the above is true and correct; and that I recognize, by signing this certification, I am also signing the contract proposal on behalf of the contractor in whose name the proposal is made, whether individual, partnership, or corporation as might be applicable.

NOTE: PROVIDED THE BID BOND ON THE FOLLOWING TWO PAGES IS PROPERLY EXECUTED IN THE CONTRACTOR'S NAME, SIGNED BY AN AUTHORIZED OFFICER OF THE CONTRACTOR CORPORATION (OR INDIVIDUAL OR PARTNER, WHEN NOT A CORPORATION), THE SAME MAY MAKE THE FOREGOING CERTIFICATIONS BY SIGNING BEFORE A PROPERLY SWORN NOTARY PUBLIC. THE CERTIFICATIONS MUST BE PROPERLY SWORN TO, SIGNED AND NOTARIZED BELOW.

Signature of Contractor. If the contractor is an INDIVIDUAL, signature of the individual is required; if contractor is a CORPORATION, signature of proper corporate officer is required; if contractor is a PARTNERSHIP, signature of partner is required; if contractor is JOINT VENTURE, appropriate signatures of all contractors are required.

Legal name of Contractor:

(Partnership, Joint Venture, Corporation or Individual)

By:

(Signature of Officer or Individual, as applicable)

By:

IF JOINT VENTURE (Signature of Officers or Individual, as applicable)

The foregoing certifications are sworn to and subscribed before me on this

_____ day of _____, 20____.

NOTARY PUBLIC

AWARD WILL NOT BE CONFERRED UNLESS THIS FORM
IS COMPLETED AND SIGNED AND WITNESSED BY A NOTARY

BIDDER'S LIST OF QUOTERS

In accordance with 49 CFR Part 26.11, the Owner will establish its State Disadvantaged Business Enterprise (DBE) goal using Bidders' Lists of Quoters. These Bidders' Lists of Quoters will be used to determine the relative availability of DBE's and Non-DBE's. Each Bidder's List of Quoters is a compilation of quoters who have submitted quotes to the Bidder during the advertising period. Subsequent to notification as Apparent Low Bidder, the Bidder must submit an **updated** Form HR-DBE prior to award of contract. Form HR-DBE will accompany Form OE-110 (DBE Utilization Plan) if appropriate.

Each time Form HR-DBE is submitted to the Owner, the Bidder shall list the quoters for the project, using additional sheets if necessary. The listing shall include EACH quoter's name, business location, telephone number and whether or not the quoter is an Alabama certified DBE. **FAILURE TO COMPLY WITH THIS REQUIREMENT MAY RENDER THE BID NON-RESPONSIVE AND THE BID MAY BE REJECTED.**

The term "quoter" shall include all subcontractors, manufacturers, and suppliers of materials.

Providing the listing of quoters in compliance with these provisions shall not be a substitute for the requirements of Subcontractors Fair Practices Act, Chapter 18, Laws of 1988, Sections 13-4-31 through 13-4-43.

BIDDER'S NAME: _____ **PROJECT NUMBER:** _____ **COUNTY:** _____

Quoter's Name	Address	Telephone Number	DBE/Non-DBE

DIVISION 104

CONTRACT

CONTRACT

THIS AGREEMENT made this the _____ day of _____, 2022, by and between herein called the "Contractor" and the City of Gadsden, Alabama, a Municipal Corporation, hereinafter called the "Owner".

WITNESSETH: That the Contractor and the Owner for the consideration stated herein mutually agree as follows:

ARTICLE 1. Statement of Work. The Contractor shall furnish all labor, materials, equipment, and services and perform and complete all work required for this project in accordance with the specifications entitled:

SPECIFICATIONS & CONTRACT DOCUMENTS
SENIOR WELLNESS CENTER
GADSDEN BID REQUEST NO. 3485
SEPTEMBER 15, 2022

and Addenda thereto numbered _____ to _____ which said Specifications, Addenda, and Drawings are incorporated herein by reference and made a part thereof.

ARTICLE 2. The Contract Price. The Owner shall pay the Contractor for the performance of the contract based on the actual quantities of work completed or material furnished in accordance with the prices shown in the following Schedule of Prices, in current funds, subject to additions and deletions as provided in the Specifications.

TOTAL CONTRACT PRICE \$ _____

ARTICLE 3. Contract Documents. The Contract shall consist of the following component parts.

- | | |
|-----------------------|-----------------------------|
| a. This Instrument | d. General Scope of Work |
| b. General Conditions | e. Technical Specifications |
| c. Special Conditions | g. Bid Documents |

This instrument, together with the other documents enumerated in this Article which said other documents are as fully a part of the Contract as if hereto attached or herein repeated, forms the contract. In the event that any provision in any component part of this contract conflicts with any provision of any other component, the provision of the component part first enumerated in this Article 3 shall govern, except as otherwise specially stated. The various provisions in Addenda shall be construed in the order of preference of the component part of the contract which each modifies.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed in four original counterparts the day and year first above written.

WITNESS

WITNESS

Contractor

By _____

Title _____

Address _____

THE CITY OF GADSDEN, ALABAMA

Sherman Guyton, Mayor

CERTIFICATIONS

I, _____, certify that I am the _____ of the corporation named as Contractor herein; that _____, who signed this Contract on behalf of the Contractor was then _____, of said Corporation, that said Contract was duly signed for and in behalf of said corporation by authority of its governing body and is within the scope of its corporate powers.

_____(SEAL)*

I, hereby certify that, Sherman Guyton, Mayor of the City of Gadsden, Alabama is the duly elected qualified official who is authorized by the City of Gadsden, Alabama to execute this contract in the name of the City of Gadsden, Alabama.

_____(SEAL)*
Iva Nelson, City Clerk

(Print or type the names underneath all signatures.)

*(Affix corporate seal where marked (SEAL).)

STATE OF ALABAMA)
COUNTY OF ETOWAH)

I, _____, a Notary Public in and for said County in said State, hereby certify that
_____ whose name as _____ of
_____, a corporation, is signed to the foregoing instrument and who is known to me,
acknowledged before me on this day that, being informed of the contents of the instrument, he, in his capacity as such
_____ executed the same voluntarily for and as the act of said corporation, on the day
the same bears date.

Given under my hand on _____, 2022

Notary Public

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, That we

hereinafter called the Principal, and

hereinafter called the surety, are held and firmly bound unto the City of Gadsden, Alabama, a municipal corporation, for use of the City of Gadsden and all persons doing work or furnishing skill, tools, machinery, supplies or materials under or for the purpose of the contract hereinafter referred to, in the full and just sum of

(\$ _____) in lawful money of the United States of America to be paid to the City of Gadsden, its successors and assigns to which payment well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a contract with the City of Gadsden, dated _____, 20____ for _____

all in strict accordance with the Pictures, Specifications, and other documents relating thereto; and

WHEREAS, it was one of the conditions of the award by the City of Gadsden, 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 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 City of Gadsden against or from all costs, expenses, damages, injury or loss, to which the City of Gadsden may be subjected by reason of any doing wrong, misconduct, want of care or skill, negligence, or default, including patent infringement, on the part of the Contractor, his agents, or employees, in the execution or performance of said Contract, and shall promptly pay all just claims for damages or injury to property and for all work done, or skill, tools, machinery, supplies, labor and materials furnished and debts incurred by the Contractor in or about the performance of the work contracted for, 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 or the work to be performed thereunder or the specification accompanying the same shall in any wise affect its obligation under 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 specification.

This bond shall be for the use of the City of Gadsden and all persons doing work or furnishing skill, tools, machinery or materials under or for the purpose of the contract hereinabove referred to.

IN TESTIMONY WHEREOF, The Principal and the Surety have caused these presents to be duly signed and sealed on this

_____ day of _____, 20____.

IN PRESENCE OF:

ATTEST:

ATTEST:

*Affix Corporate Seals

_____(SEAL)*

Individual Principal

Business Address

Corporate Principal

By_____(SEAL)*

Business Address

Corporate Surety

By_____(SEAL)*

Business Address

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 said bond on behalf of the principal was then _____ of said Corporation; that I know his signature, and his signature is genuine; and that said bond was duly signed, sealed and attested for and in behalf of said Corporation by authority of its governing body.

_____(SEAL)*

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

Total amount of premium charged, \$ _____.

NOTE: The above must be filled in by Corporate Surety

*Affix corporate seal.

LABOR AND MATERIAL BOND

KNOW ALL MEN BY THESE PRESENTS, That we

hereinafter called the Surety, are held and firmly bound unto the City of Gadsden, Alabama, hereinafter called the "City of Gadsden", a municipal corporation, for use of the City of Gadsden, and all persons doing work or furnishing skill, tools, machinery, supplies or materials under or for the purpose of the contract hereinafter referred to, in the full and just sum of _____ Dollars (\$ _____), in lawful money of the United States of America to be paid to the City of Gadsden, its successors and assigns to which payment well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a contract with the City of Gadsden, dated

_____, 20__ for _____

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

WHEREAS, It was one of the conditions of the award by the City of Gadsden, pursuant to which the contract hereinabove referred to was entered into, that these presents shall be executed:

NOW, THEREFORE, The condition of this obligation is such, that, if said principal and all sub-contractors to whom any portion of the work provided for in said Contract is sublet and all assignees of said Principal and of such sub-contractors shall promptly make payments to all persons supplying him or them with labor, materials, foodstuffs or supplies for or in prosecution of the work provided for in such Contract as well as repay the City of Gadsden any such which the City of Gadsden may pay because of any lien for labor or materials furnished for the work included in said Contract or any amendment or extension of or addition to said Contract, and for the payment of reasonable attorney's fees, incurred by the Claimant or Claimants, in suits on said bond, the above obligation shall be void, otherwise to remain in full force and effect;

PROVIDED, HOWEVER, That this Bond is subject to the following further conditions and limitations:

(a) Any person, firm, or corporation that has furnished labor, materials, stuffs food, or supplies for or in the prosecution of the work provided for in said Contract shall have a direct right of action against the Principal and Sureties on this bond, right of action shall be asserted in a proceeding instituted in the County in which the work provided for in said Contract is to be performed or in any County in which said Principal or Sureties do business. Such right of action shall be asserted in a proceeding instituted in the name of the Claimant or Claimants for his or their use and benefit against said Principal and Sureties or either of them (but not later than one year after the final settlement of said contract) in which action such claim or claims shall be adjudicated and judgment rendered thereon.

(b) The Principal and Sureties hereby designate and appoint the City Clerk of the City of Gadsden as the agents of each of them to receive and accept service of process or other pleading issued or filed in any proceeding instituted on this bond and hereby consent that such services shall be the same as personal service on the Principal and/or Sureties.

(c) This bond is given pursuant to the terms of Sections 39-1-1 et seq, Code of Alabama, 1975.

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

This Bond shall be for the use of the Owner and all persons doing work or furnishing skill, tools, machinery, or materials under or for the purpose of the Contract hereinabove referred to.

The undersigned principal and surety do further hereby consent and yield to the jurisdiction of the State Civil Courts of Etowah County, Alabama, and shall assure all undertakings under said agreement or contract shall assure and protect all laborers and furnishers of material on said work both as required by applicable law.

IN TESTIMONY WHEREOF, the Principal and the surety have caused these presents to be duly signed and sealed on the _____ day of _____, 20____.

IN PRESENCE OF:

ATTEST:

Individual Principal

Business Address

(Corporate Principal)

By _____ (SEAL)*

(Business Address)

(Corporate Surety)

By _____ (SEAL)*

(Business Address)

ATTEST:

*Affix corporate seals.

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 said bond on behalf of the principal was then _____ of said Corporation; that I know his signature, and his signature is genuine; and that said bond was duly signed, sealed and attested for and in behalf of said Corporation by authority of its governing body.

_____(SEAL)*

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

Total amount of premium charged, \$ _____.

Note: The above must be filled in by Corporate Surety.

DIRECTIONS FOR PREPARATION OF PERFORMANCE AND LABOR AND MATERIAL BONDS

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 be not less than that required by the Specification.
4. If the Principals are partners, or joint ventures each member shall execute the bond as an individual, with his place of residence shown.
5. If the Principal is a corporation, the bond shall be executed under its corporate seal. If the corporation has no corporate seal, the fact shall be stated, in which case a scroll or adhesive seal shall be affixed following the corporate name.
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 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 name underneath each signature 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.

The full names and residences of persons and firms interested in the foregoing bids; as Principals are as follows:

_____	_____
_____	_____
_____	_____

CONTRACT PROVISION

The Contractor shall comply with Section 107 of the Contract Work Hours and Safety Standard Act (40 USC 327-330) as supplemented by Department of Labor Regulations (29 CFR; Part 5). Section 107 of the Act is applicable to construction work and provides that no laborer or mechanic shall be required to work in, surrounding or under working conditions which are unsanitary, hazardous or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor. These requirements do not apply to the purchase of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

The Contractor shall comply with applicable standards, orders or requirements issued under Section 306 of the Clean Air Act (42 USC 1857 (h)), Section 508 of the Clean Water Act (33 USC 1368), Executive Order 11738 and Environmental Protection Agency regulations (40 CFR, Part 15) which prohibits the use under non-exempt Federal contracts, grant or loans of facilities included on the EPA Listing of Violating Facilities. Violations shall be reported to the owner and the USEPA Assistant Administrator for Enforcement. (EN-329)

Contract will recognize as adopted, in the future, any mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy.

Date: _____

CERTIFICATION OF CONTRACT

DATE: _____

CONTRACT: Senior Wellness CenterPARTIES: Owner: City of GadsdenContractor:BID NO. 3485

I certify that, to the best of my knowledge, the public works contract named above is let in compliance with Title 39, Code of Alabama, 1975, as amended, and all other applicable provisions of law.

Sherman Guyton, Mayor_____
Date

CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned, the duly authorized and acting legal representative of the City of Gadsden do hereby certify as follows:

I have examined the attached contract(s) and documents executed by the City of Gadsden and I am of the opinion that each of the aforesaid agreements has been duly executed by the City of Gadsden, acting through its duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of Gadsden; that the foregoing agreements constitute valid and legally binding obligations upon the City of Gadsden, in accordance with terms, conditions and provisions thereof; and that the contract is the result of procurement in accordance with Title 39 of the Alabama Code and applicable federal laws, rules and regulations, as they apply to the City of Gadsden.

City Attorney

Date

DIVISION 105

GENERAL CONDITIONS

GENERAL CONDITIONS

105.1 DEFINITIONS

Wherever used in any of the contract documents, the following meanings shall be given to the terms herein defined:

- a. The "Contract" means the contract executed by the Owner and the Contractor, of which these General Conditions form a part. The documents which comprise the contract are set forth in the contract form.
- b. The terms "Owner" and "Contractor" mean the respective parties to the contract.
- c. The "Engineer" is the Director of Engineering of the City of Gadsden, Alabama, or his duly authorized representative.
- d. The term "Project" means the construction work for which is contemplated in whole or in part under this contract.
- e. The term "Specifications" means the volume which includes, the Instructions and Forms (Invitation for Bids, Instructions to Bidders, Bid, Bid Bond, non-Collusive Affidavit, Statement of Bidder's Qualifications, Contract and Performance and Payment of Bond or Bonds), the General Specifications (consisting of the General Conditions, the Special Condition, and the General Scope of Work) and the Technical Specifications.

105.2 CONTRACTOR

Only one Contractor is recognized as a party to this Contract, and where the term "Contractor" is used, the prime Contractor who signed this Contract is referred to. For convenience, the Technical Specification have been divided into separate headings or divisions to cover the various trades and types of materials represented in the work, and where terms such as "Concrete Contractor", "Grading Contractor", and other "Contractors" are referred to, it has been for convenience only.

105.3 SUPERINTENDENCE BY CONTRACTOR

- a. The Contractor shall give his personal superintendence to the work or have a competent superintendent on the work at all times during progress with full authority to act for him. The Contractor shall also provide an adequate staff for the proper coordination and expediting of his work.

105.4 SUBCONTRACTS

- a. The Contractor shall not award any work to any Sub-Contractor without prior approval of the Owner, which approval will not be given until the Contractor submits to it a written statement containing such information as the Owner may require concerning experience and qualifications meeting the technical specification requirements as well as the proposed Sub-Contractor's non-collusion affidavit in the following form:

GENERAL CONDITIONS

NON-COLLUSION AFFIDAVIT OF SUBCONTRACTOR

STATE OF _____

COUNTY OF _____

_____, being first duly sworn, deposes
and says that:

- (1) He is _____ of _____
(Owner or Partner or Officer) (Firm)
_____, The Bidder that has submitted the attached Bid;
- (2) He is fully informed respecting the preparation and contents of the attached Bid and of all circumstances respecting such Bid;
- (3) Such Bid is genuine and is not collusive or sham Bid;
- (4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed directly or indirectly with any other Bidder, firm or person to submit a collusive or sham bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the bid price or the Bid price of any other bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Local Authority or any person interested in the proposed Contract; and
- (5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

(Signed)

Subscribed and sworn to before me
this ____ day of _____, _____

(Notary Public)

My Commission Expires _____, _____

GENERAL CONDITIONS

b. No proposed Sub-Contractor shall be disapproved except for cause.

c. The Contractor shall be as fully responsible to the Owner for the acts and omissions of his Sub-Contractors and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

d. The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind Sub-Contractors to the Contractor by the terms of the General Conditions, Special Conditions and other documents comprising the Contract insofar as they are applicable to the work of Sub-Contractors and to give the Contractor the same power as regards terminating any subcontract the Owner may exercise over the Contractor under any provisions of the Contract. The Contractor shall insert in each of his subcontracts the provisions (appropriately modified) of Sections 105.32, 105.34 and 105.35 of these General Conditions.

e. Nothing contained in the Contract shall create any contractual relation between any Sub-Contractor and the Owner.

f. LIMITATIONS: The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the contract or contracts or any portion thereof, or of his right, title, or interest therein, without written consent of the Engineer. If such consent is given, the Contractor will be permitted to sublet a portion of the work, but shall perform with his own organization, work amounting to not less than fifty percent (50%) of the total contract cost. Any items designated by the Engineer as "specialty items" may be performed by subcontract and the cost of any such specialty items performed by contract may be deducted from the total cost before computing the amount of work required to be performed by the Contractor with his own organization. No subcontracts or transfer of contract shall relieve the Contractor of his liability under the contract and bonds.

105.5 OTHER CONTRACTS

The Owner may award other contracts for additional work, and the Contractor shall fully cooperate with such other Contractors and carefully fit his own work to that provided under other contracts as may be directed by the Owner. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other Contractor. Where more than one prime Contractor is employed on the site, it shall be responsibility of the Owner to coordinate the work of all such prime Contractors unless otherwise expressly provided herein.

105.6 FITTING AND COORDINATION OF THE WORK

The Contractor shall be responsible for the proper fitting of all work and for the coordination of the operations of all trades, Sub-Contractors, or materialmen engaged upon the work. The Contractor shall be prepared to guarantee to each of his Sub-Contractors the dimensions which they may require for the fitting of their work to all surrounding work and shall do, or cause his agents to do, all cutting, fitting, adjusting, and patching necessary to make the several parts of the work come together properly and to fit the work to receive, or be received by, that of other Contractors.

105.7 MUTUAL RESPONSIBILITY OF CONTRACTORS

If, through acts of neglect on the part of the Contractor, any other Contractor or any Sub-Contractor shall suffer loss or damage on the work, the Contractor agrees to settle with such other Contractor or Sub-Contractor by agreement or arbitration, if such other Contractor or Sub-Contractor will so settle. If such other Contractor or Sub-Contractor shall assert any claim against the Owner on account of any damage alleged to have been so sustained, the Owner shall notify the Contractor, who shall defend at his own expense any suit based upon such claim, and, if any judgment or claim against the Owner shall be allowed, the Contractor shall pay or satisfy such judgment or claim and pay all costs and expenses in connection therewith.

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105.8 PAYMENTS TO CONTRACTOR

a. Subject to submission by the Contractor of the written certifications required of him and his Sub-Contractors by Section 105.32 of the General Conditions, partial payments will be made as the work progresses not later than the fifteenth day of each calendar month for work done during the preceding calendar month on estimates certified by the Engineer. In preparing estimates only the material in place will be considered. Estimates for monthly payments must be submitted at least twenty (20) days in advance of the date set for payment.

b. In making such partial payments for the work there shall be retained five percent (5%) of the estimated amount up to fifty percent (50%) of contract amount until final completion and acceptance of all work covered by the Contract.

c. All work covered by partial payments made shall thereupon become the sole property of the Owner. This provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of work upon which payments have been made or the restoration of any damaged work, whether such damage has been caused by the Contractor or by other Contractors of the Owner or others, or as a waiver of the right of the Owner to require the fulfillment of all terms of the Contract. In the event the work of the Contractor has been damaged by other Contractors or by others than the employees of the Owner in the course of their employment, the Contractor agrees to restore such damaged work without cost to the Owner and to seek redress for his damage only from those who directly caused it.

d. Upon completion and acceptance by the Engineer of all Work required hereunder, the Engineer shall issue a final certificate that the balance is due the Contractor. Immediately after receipt of the final certificate the Contractor shall give notice of said completion of the work by advertisement in some newspaper of general circulation published in the City of Gadsden, Alabama, for a period of four (4) successive weeks. Proof of publication of said notice shall be made by the Contractor to the Owner by affidavit of the publisher, to which affidavit shall be attached a printed copy of the notice, provided by Section 39-1-1(f), 1975 Code of Alabama. Upon the expiration of ten days following the fourth publication, but not earlier than thirty (30) days

after the completion and acceptance of the work and issuance of final certificate aforesaid, the Owner shall make final payment to the Contractor of the balance due under the Contract, less such amounts as may have been withheld by the Owner from time to time, as provided for in these specifications.

e. The Owner, before making any payment, may require the Contractor to furnish releases or receipts from all persons performing work and supplying material to the Contractor, if the Owner deems the same necessary in order to protect its interests. The Owner, however, may make payment in part or in full to the Contractor without requiring the furnishing of such releases or receipts and any payments so made shall in nowise impair the obligations of any surety or sureties on any bond or bonds furnished under this contract.

f. The Owner may withhold from any payment otherwise due the Contractor so much as may be necessary to protect the Owner against any claims that may be urged against the Owner and, if it so elects, may also withhold any amounts due from the Contractor to any subcontractors or materialmen, for labor or material furnished by them. The foregoing provisions shall be construed solely for the benefit of the Owner and shall not require the Owner to determine or adjust any claims or disputes between the Contractor and his Sub-Contractors or materialmen, or to withhold any moneys for their protection unless the Owner elects to do so. The failure or refusal of the Owner to withhold any moneys from the Contractor shall in nowise impair the obligations of any surety or sureties under any bond or bonds furnished under this Contract.

105.9 CHANGES IN THE WORK

a. The Owner may make changes in the work of the Contractor by making alterations therein, or by making additions thereto, or by omitting work therefrom, without invalidating the Contract, and without relieving or releasing the Contractor from any guarantee given by him pursuant to the Contract provisions, and without affecting the validity of the guaranty bonds, and without relieving or releasing the surety or sureties of said bonds. All such work shall be executed under the conditions of the original contract.

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b. Except in an emergency endangering life or property, no change shall be made by the Contractor unless in pursuance of a written order from the Engineer, authorizing the change and no claim for any adjustment of the Contract Price or time shall be valid unless so ordered.

c. In determining the value of any change, either additive or subtractive, the contracting parties are restricted to the use of the three following methods, singly or in combination. Method (1) shall be used to establish the equitable value of the change in every case where it can be fixed prior to performance of the changed work. Method (2) and no other, shall be used to establish changed values for any and all items for which unit prices are set forth in the Contract. Method (3) shall be used only to establish values which are indeterminate otherwise, or in an emergency endangering life or property. The Engineer at the time he issues the written order to proceed shall in the case of both methods (2) and (3), fix a maximum amount to be spent on the work which shall not be exceeded. If additional work remains to be done after that sum has been expended, the additional work shall be the subject of a separate written order.

1. The contracting parties shall negotiate and agree upon the equitable value of the change prior to issuance of the Order, and the order shall stipulate the corresponding lump sum adjustment of the Contract Price.

2. The applicable unit price shall be applied to the net change in quantity, estimated or actual as agreed, of the item involved.

3. The order shall direct the Contractor to proceed on a time and material basis, whereupon the Contractor shall so proceed and keep accurately and present, in such form and at such times as the Engineer may require, a correct account of the cost, together with all proper vouchers and supporting papers therefore. Upon completion of the change and agreement upon the total value thereof, the Engineer shall issue a second written order, processed in accordance with the provisions of Section 105.10b or 105.10c, effecting the equitable adjustment of the contract price.

d. Under Methods (1 and (3), for extra work performed, the allowances for overhead and profit combined, included in the total cost to the Owner shall not exceed ten percent (10%) of the

Contractors net additional cost. There shall be no additional cost added under method (2).

This percentage shall be applied to the net additional cost as defined in subsection e. immediately following. If the net cost value of a change results in a credit from the Contractor, the credit given shall be the net cost without overhead or profit.

e. The "net cost" as used herein shall mean the difference between all proper cost additions and deductions. The "Cost" as used herein may include all items of labor or materials, the use of power tools and equipment, and all such items of cost as public liability and workmen's compensation insurance, pro rate charges for foremen, social security, old age and unemployment insurance. Among the items to be considered as overhead are insurance other than as mentioned above, bond premiums, supervision, superintendents, timekeepers, clerks, watchmen, small tools, incidental job burdens and general office expense, and all other items not included in the cost as herein defined.

f. Every order issued by the Engineer which effects an adjustment of the contract price shall be supported by itemized, bona fide, written proposal from the Contractor to the Owner, submitted prior to preparation of the order, in multiple copy form as required.

g. Should the Contractor encounter or the Engineer discover during the process of the work, sub-surface or latent conditions at the site materially differing from those shown in the Specifications, the attention of the Engineer shall immediately be called to such conditions before they are disturbed. If the Engineer finds that they so materially differ, he shall at once make such changes in the Specifications as he may find necessary, and any adjustment in the Contract price or time as may be justifiable shall be made by means of a written order as provided herein.

h. Subject to the provisions of Section 10 and 12 of the General Conditions justifiable extensions of Contract time because of changes ordered may be granted by the Owner.

105.10 CLAIMS FOR EXTRA COST

a. If the Contractor claims that any instructions involve extra cost or extension of time, he shall,

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within ten days after the receipt of such instructions, and in any event before proceeding to execute the work, submit his protest thereto in writing to the Engineer stating clearly and in detail the basis of his objections. No such claim shall be valid unless so made.

b. Claims for additional compensation for extra work, due to alleged errors in spot elevations, contour lines, or bench marks, will not be recognized unless accompanied by certified survey data, and prior to the time the original ground was disturbed, clearly showing that errors exist which resulted, or would result, in handling more material, or performing more works, than would be reasonably estimated from the plans and maps issued.

c. Any discrepancies which may be discovered between actual conditions and those represented by the maps and plans shall at once be reported to the Engineer, and work shall not proceed, except at the Contractor's risk, until written instructions have been received by him from the Engineer.

d. If, on the basis of the available evidence, the Engineer determines that an adjustment of the Contract price or time is justifiable, the procedure shall then be as provided herein for "Changes in the work".

e. By execution of the Contract, the Contractor warrants that he has visited the site of the proposed work and fully acquainted himself with the conditions there existing relating to construction and labor, that he understands that other contracts will be let for other work, which other work will be performed in the same general area or contiguous thereto during part or all of the time that he performs his Contract, and that he fully understands the facilities, difficulties and restrictions attending the execution of the work under the Contract, and that he will make no claim for extra compensation because of said conditions, restrictions or difficulties, or because his work has been delayed or interfered with by reason of the fact that others are working in the same general area or contiguous thereto. The Contractor further warrants that he has thoroughly examined and is familiar with the Specifications, and all other documents comprising the Contract. The Contractor further warrants that by execution of this Contract his failure when he was bidding on this Contract to receive or examine any form, instrument or document or to visit the site and acquaint himself with conditions there existing, in

no wise relieves him from any obligation under the Contract and the Contractor agrees that the Owner shall be justified in rejecting any claim based on facts regarding which he should have been on notice as a result thereof.

105.11 RIGHT OF OWNER TO TERMINATE CONTRACT

If the Contractor should be adjudged a bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he should persistently or repeatedly refuse or fail to supply enough properly skilled workmen or proper materials, or if he should fail to make prompt payment to his employees or to his Sub-Contractors, or persistently disregard instructions of the Owner or Engineer or fail to observe or perform the provisions of the Contract, or otherwise be guilty of substantial violation of any provision of the Contract, then the Owner may, by at least five days prior written notice to the Contractor, without prejudice to any other rights or remedies of the Owner, terminate the Contractor's right to proceed with the work. In such event, the Owner may take over and prosecute the work to completion, by contract or otherwise and the Contractor and his sureties shall be liable to the Owner for any excess cost occasioned the Owner thereby. In any such case the Owner may take possession of and utilize in completing the work such materials, appliance, and plant as may be on the site of the work and necessary therefore. The foregoing provisions are in addition to, and not in limitation of the Owner's rights under any other provisions of the Contract.

105.12 DELAYS - DAMAGES

a. If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with such diligence as will ensure its completion within the time specified in the Special Conditions, Division 106, or any extension thereof, or fails to complete said work within such times, the Owner may by written notice to the Contractor, terminate his right to proceed with the work or such part of the work as to which there has been delay. In such event the Owner may take over the work and prosecute the same to completion, by contract or otherwise and the Contractor and his sureties shall be liable to the Owner for any excess cost

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occasioned the Owner thereby. If the Contractor's right to proceed is so terminated, the Owner may take possession of and utilize in completing the work such materials, appliances and plant as may be on the site of the work and necessary therefore. Until such time as the Owner terminates the right of the Contractor to proceed, the Contractor shall continue the work, and the Contractor shall pay to the Owner as fixed, agreed and liquidated damages (it being impossible to determine the actual damages occasioned by the delay) for each calendar day of delay until the work is completed, or accepted, or until such time as the Contractor's right to proceed shall be terminated, the amount as set forth in the Special Conditions, and the Contractor and his sureties shall be liable for the amount thereof. In the event the Owner shall at any time subsequent to the date of completion, as established in the Contract or any amendment thereto, terminate the Contractor's right to proceed, such termination shall not relieve the Contractor of the payment of the liquidated damages which have accrued from the completion date as established in the Contract, up to and including the date of the termination of the Contractor's right to proceed. The right of the Contractor to proceed shall not be terminated or the Contractor charged with liquidated damages because of any delays in the completion of the work due to unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to acts of God, or of the public enemy, acts of the Government, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantines, restrictions, strikes, freight embargoes, and unusually severe weather or delays of Sub-Contractors due to such cause, if the Contractor shall within ten (10) days from the beginning of any such delay notify the Engineer in writing of the causes of delay, the Engineer shall ascertain the facts and the extent of delay. The Owner shall extend the time for completing the work when in its judgment the findings of facts of the Engineer justify such an extension, and his findings of fact thereon shall be final and conclusive upon the parties hereto.

b. No payment or compensation of any kind shall be made to the Contractor for damages because of hindrance or delay from any cause in the progress of the work, whether such hindrances or delays be avoidable or unavoidable.

105.13 ASSIGNMENT OF CONTRACT

The Contractor's obligation and duties under this Contract shall not be assigned in whole or in part by the Contractor without the written approval of the Owner, but this shall not prohibit the assignment of the proceeds due hereunder to a bank or financial institution, nor shall this provision preclude the Contractor from subletting, as provided in this Contract, parts of the work in accordance with the general practice of the construction industry. This Contract may be assigned by the Owner to any corporation, agency, or instrumentality authorized to accept such assignment.

105.14 OWNERSHIP OF SPECIFICATIONS

Except the Contractor's executed set, all specifications are and remain the property of the Owner. Such specifications are not to be used on other work, and those sets in usable condition shall be returned to the Owner, upon request, at the completion or cessation of the work or termination of the contract.

105.15 SHOP DRAWINGS

a. Shop drawings of all fabricated work shall be submitted to the Architect for approval and no work shall be fabricated by the Contractor save at his own risk, until approval has been given. The Contractor will be advised as to the exact procedure to be followed with respect to the number of prints required, where submitted, letters of transmittal, making corrections, etc. Five (5) prints of finally approved shop drawings will be required.

b. The Contractor shall submit all shop drawings on dates sufficiently in advance of requirements to afford the Architect ample time for checking same, including time for correcting, resubmission and recheck, if necessary, and no claim for extension of the contract time will be granted the Contractor by reason of his failure in this respect.

c. All shop drawings submitted must bear the stamp of approval of the Contractor as evidence that the drawings have been checked by the Contractor. Any drawings submitted without this stamp of approval will not be considered and will be returned to the Contractor for proper

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resubmission. If the shop drawings show variations from the requirements of the Contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment; otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract even though such shop drawings have been approved.

d. Where a shop drawing as submitted by the Contractor indicates a departure from the Contract which the Architect deems to be a minor adjustment in the interest of the Owner not involving a change in Contract price or extension of time, the Architect may approve the drawings but the approval will contain, in substance, the following:

"The modification shown on the attached drawing is approved in the interest of the Owner to effect an improvement for the project and is ordered with the understanding that it does not involve any change in the contract price or time; that it is subject generally to all Contract stipulations and covenants; and that it is without prejudice to any and all rights of the Owner under the Contract and bond or bonds."

e. The approval of the shop drawings will be general and shall not relieve the Contractor from the responsibility for adherence to the Contract, nor shall it relieve him of the responsibility for any error which may exist.

105.16 REQUESTS FOR SUPPLEMENTARY INFORMATION

a. It shall be the responsibility of the Contractor to make timely requests of the Architect for such additional information, not already in his possession, which he will require in the planning and production of the work. Such requests may be submitted from time to time as the need is approached, but each such request shall be filled in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay. Each request shall be in writing, and shall list the various items and the latest date by which each will be required by the Contractor. The first list shall be submitted within two weeks after the Contract award and shall be as complete as

possible at that time. The Contractor shall, if requested, furnish promptly any assistance and information which the Engineer may require in responding to the requests of the Contractor. The Contractor shall be fully responsible for any delay in his work or to others arising from his failure to comply fully with the provisions of this Section.

105.17 MATERIALS AND WORKMANSHIP

a. Unless otherwise specifically provided for in the Technical Specifications, all workmanship, equipment, materials and articles incorporated in the work shall be new and the best grade of the respective kinds for the purpose. Where equipment, materials, articles or workmanship are referred to in the Technical Specifications as "equal" to any particular standard, the Architect shall decide the question of equality.

b. The Contractor shall furnish to the Architect for approval the name of the manufacturer of machinery, mechanical and other equipment which he contemplates installing together with full information as to type, performance characteristics, and all other pertinent information as required, and shall likewise submit for approval as required full information concerning the materials or articles which he proposes to incorporate in the work. (See Samples, Certificates, and Tests" Section 20 of the General Conditions).

c. Machinery, mechanical and other equipment, materials or articles installed or used without such prior approval shall be at risk of subsequent rejection.

d. Materials specified by reference to the number or symbol of a specific standard, such as American Society for Testing Materials, and American Association of State Highway Officials or other similar standard, shall comply with requirements in the latest revision thereof and any amendment or supplement thereto in effect on the date of the Invitation for Bids, except as limited to type, class or grade, or modified in such reference. The standards referred to, except as modified in the Technical Specifications, shall have full force and effect as though printed therein.

e. Specific reference in the Technical Specifications to any article, device, product, material, fixture, form, or type of construction, etc., by name, make or catalog number shall be

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interpreted as establishing a standard of quality and shall not be construed as limiting competition, and the Contractor in such cases, may at his option use any article, device, product, or material, fixture, form or type of construction which, in the judgment of the Architect expressed in writing, is equal to that named.

105.18 SAMPLES, CERTIFICATES AND TESTS

a. No material for which samples are required shall be delivered to the site for use until representative samples have been approved in writing by the Architect.

b. The Contractor shall furnish for approval all samples (and certificates related to them) as stipulated under the several divisions of the Technical Specifications as well as all other samples as requested by the Architect. Samples shall be delivered with all transportation charges prepaid to a location designated by the Architect and in ample time for proper consideration and action. In general, twenty (20) days is the minimum time required for making tests.

c. Pack samples so as to reach their destination in good condition; ship in tight metal containers samples of paste or liquid materials.

d. Label, or otherwise properly mark on the container the material or product represented, its place or origin, the name of the producer, the name of the Contractor, and the name and symbol of the Project for which it is intended.

e. Submit to the Architect, in triplicate, a certificate describing each sample submitted for approval, certifying that the material, equipment or accessory submitted complies with Contract requirements. The certificate shall include the following information:

1. Name and brand of the product, name of manufacturer, location of plant.
2. Name and location of at least two projects on which substantial quantities of the Material represented by the samples were used, and the approximate dates of use or installation.
3. An outline showing chemical and physical properties of the material represented by the sample submitted and giving the name of the

laboratory or testing authority which obtained the data, and the dates of the tests.

(Note: The information required by this subparagraph (3) may be omitted in the case of materials required to conform to standard as specified; provided, a certified statement by an acceptable laboratory or testing authority is furnished in lieu thereof.)

4. If the statement originates with the producer, the Contractor shall endorse all claims and submit the statement in his own name; he shall also guarantee that all materials furnished for use on the Project will be in compliance with the samples and certified statements.

f. Approval of any material shall be general only and shall not constitute a waiver of the Owner's right to demand full compliance with Contract requirements after actual deliveries, the Owner will make such check tests as it deems necessary in each instance and may reject materials and equipment and accessories for cause, even though such materials and articles have been given general approval. If materials, equipment or accessories which fail to meet check tests have been incorporated in the work, the Owner shall have the right to cause their removal and replacement by proper materials or to demand and secure such reparation by the Contractor as is equitable

g. When a material has been approved, no change in brand or make will be permitted unless:

1. The manufacturer cannot make satisfactory delivery; or
2. The material delivered fails to comply with the Contract requirements.

h. Whenever materials are required to comply with A.S.T.M. Standards or AASHTO Specifications, and such specification shall be accepted as establishing the technical qualities and testing methods, they shall not govern the number of tests required to be made. The number of tests required on material delivered, for use shall in all cases be at the discretion of the Owner. They may require laboratory tests on samples submitted for approval or they may approve materials on the basis of data submitted in certificates with samples.

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i. Check tests will be made on materials delivered for use only as frequently as the Owner considers necessary to ensure compliance of materials used with Contract requirements.

j. Except as otherwise specifically stated in the Contract, the costs of sampling and testing will be divided as follows:

1. The Contractor will furnish without extra cost, including packing and delivery charges, all samples required for testing purposes.

2. The Contractor will assume all costs of retesting materials which fail to meet contract requirements.

3. The Contractor will assume all costs of testing materials offered in substitution for those found deficient; and

4. The Owner will pay all other expenses.

105.19 PERMITS AND CODES

The Contractor shall give all notices and comply with all applicable laws, ordinances, codes, rules and regulations. The contractor shall obtain a City of Gadsden business license and all applicable building permits required prior to commencing work. The intent of this Contract is that the Contractor shall base his bid upon the Specifications, but that 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 Specifications for compliance with applicable codes and regulations bearing on the work, and shall immediately report any discrepancy to the Engineer. Where the requirements of the Specification fail to comply with the applicable code and regulation, the Owner shall adjust by change order the Contract to conform to the code or regulation (unless waivers in writing covering the differences have been granted by the governing authority) and shall make appropriate adjustment in the Contract price. Should the Contractor fail to observe the foregoing provisions and install work at variance with any applicable code or regulation as may be amended by waivers (notwithstanding the fact that such installation is in compliance with the Technical Specifications), the Contractor shall remove such work without cost to Owner, but a change order shall be issued to cover only the excess cost the

Contractor would have been entitled to receive if the change had been made before the Contractor commenced work on the item involved.

105.20 CARE OF THE WORK

a. The Contractor shall be responsible for all damages to persons or property that occur as a result of his fault or negligence in connection with the prosecution of the work and shall be responsible for the proper care and protection of all materials delivered and work performed until completion and final acceptance, whether or not the same has been covered by partial payments made by the Owner, and whether or not the damage to his work was caused by the Contractor or by other Contractors, or by other than the employees of the Owner in the course of their employment.

b. The Contractor shall provide and maintain sufficient barricades, signs signals and competent watchmen required, both day and night, including Saturdays, Sundays, and Holidays, from the time the work is commenced until final completion and acceptance, in accordance with the latest edition of the Alabama Manual on Uniform Traffic Control Devices.

c. In an emergency affecting the safety of life or property, including adjoining property, the Contractor, without special instructions or authorization or authorization from the Owner, is authorized to act at his discretion to prevent such threatened loss or injury, and he shall so act. Likewise, he shall so act if instructed to do so by the Architect. Any compensation claimed by the Contractor on account of such emergency work shall be determined by the Architect, and as provided in the Contract.

d. The Contractor shall avoid damage as a result of his operations to existing sidewalks, streets, curbs, pavements, utilities, adjoining property, the work of other Contractors and the property of the Owner and others, and he shall at his own expense completely repair any damage thereto caused by his operations.

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

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the construction of the Project. The Contractor shall be responsible for the giving of any and all required notices to any adjoining or adjacent property owner or other party before the commencement of any work. The Contractor shall indemnify and save harmless the Owner from any damages on account of settlements or the loss of lateral support of adjoining property and from all loss or expense and all damages from which the Owner may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

105.21 ACCIDENT PREVENTION

The Contractor shall exercise proper precaution at all times for the protection of persons and property. The safety provisions of applicable law, building and construction codes shall be observed, and the Contractor shall be responsible for any additional safety and health measures required to provide a safe construction operation. Machinery equipment and all hazards shall be guarded in accordance with the safety provisions of the Manual of Accident Prevention in Construction published by the Associated General Contractors of America to the extent that such provisions are not in contravention of applicable law.

105.22 SANITARY FACILITIES

The Contractor shall furnish, install, and maintain ample sanitary facilities for the workmen. As the needs arise, enclosed temporary toilets, in sufficient number, shall be placed as needed. Drinking water shall be provided from a proved safe source, so piped or transported as to be kept clean and fresh and served from single service containers or satisfactory types of sanitary drinking stands or fountains. All such facilities and services shall be furnished in strict accordance with existing governing health regulations.

105.23 USE OF PREMISES

a. The Contractor shall confine his apparatus, storage of materials, and construction operation to the limits prescribed by ordinances or permits or as may be directed by the Architect or Owner, and

shall not unreasonably encumber the premises with his materials.

b. The Contractor shall not load any structure or permit any part thereof to be loaded to such an extent as to endanger its safety.

c. The Contractor shall comply with and enforce any instruction of the Architect, or local laws regarding signs, advertising, fires, danger signals, barricades and smoking.

105.24 REMOVAL OF DEBRIS, CLEANING, ETC.

The Contractor shall, periodically or as directed during the progress of the work, remove and properly dispose of the resultant dirt and debris, and keep the premises reasonably clean. Upon completion of the work, he shall remove all temporary construction, facilities and unused materials provided for the work, and put the project and premises in a neat and clean condition and do all cleaning and washing required by the Specifications. Trash and combustible materials shall not be allowed to accumulate on the premises.

105.25 INSPECTION

a. All material and workmanship shall be subject to inspection, examination or test by the Architect at any and all times during manufacture or construction and at any and all places where such manufacture or construction is carried on. The Architect shall have the right to reject defective material and workmanship or require its correction. Rejected workmanship shall be satisfactorily corrected. Rejected material shall be promptly segregated and removed from the premises and satisfactorily replaced with proper material without charge thereof. If the Contractor fails to proceed at once with the correction of rejected defective material or workmanship, the Architect or Owner may by contract or otherwise have the defects remedied or rejected materials removed from the site and charge the cost of the same against any moneys which may be due the Contractor, without prejudice to any other rights or remedies of the Owner.

b. The Contractor shall furnish promptly all materials reasonably necessary for any tests that

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may be required. (See Samples, Certificates and Tests, Section 105.20 of the General Conditions). All tests by the Architect shall be performed in such manner as not to unnecessarily delay the work. Special, full size, and performance tests shall be as described in the Technical Specifications.

c. If any work be covered up without approval or consent of the Architect, it must, if requested by the Architect, be uncovered at the expense of the Contractor. Should it be considered necessary or advisable by the Architect at any time before final acceptance of the entire work to make an examination of work already completed, by removing or tearing out same, the Contractor shall on request promptly furnish all necessary facilities, labor, and material. If such work is found to be defective in any material respect, due to fault of the Contractor or his Sub-Contractors, the Contractor shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the examination, replacement cost plus fifteen per cent (15%), shall be allowed the Contractor and he shall, in addition, if completion of the work of the entire Contract has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.

d. Inspection of material and finished articles to be incorporated in the work at the site may be made at the place of production, manufacture, or shipment whenever the quantity justifies it, unless otherwise stated in the Technical Specifications; and such inspection and acceptance, unless otherwise stated in the Technical Specifications, shall be final, except as regards (1) latent defects, (2) departures from specific requirements of the Contract, (3) damage or loss in transit, or (4) fraud or such gross mistakes as amount to fraud. Subject to the requirements contained in the preceding sentence, the inspection of material and workmanship for final acceptance as a whole or in part shall be made at the site.

e. Neither inspection, testing, approval nor acceptance of the work, in whole or in part, by the Owner or its agent shall relieve the Contractor of his sureties of full responsibility for materials furnished or work performed not in strict accordance with the Contract.

105.26 REVIEW BY OWNER

The Owner and its authorized representatives and agents, shall, at all times, have access to and be permitted to observe and review all work, materials, equipment, payrolls, personnel records, employment conditions, material invoices, contracts, books of account, and other relevant data and records; provided, however, that all instructions and approvals with respect to the work shall be given to the Contractor only by the Owner, the Architect or their authorized representatives or agents.

105.27 FINAL INSPECTION

a. When the work is substantially completed the Contractor shall notify the Architect in writing that the work will be ready for final inspection on a definite date which shall be stated in such notice. Such notice shall be given at least ten (10) days prior to the date stated for final inspection.

105.28 DEDUCTION FOR UNCORRECTED WORK

If the Owner deems it inexpedient to require the Contractor to correct work injured or not done in accordance with the Contract, an equitable deduction from the Contract Price shall be made by agreement between the Contractor and the Owner.

105.29 INSURANCE

The Contractor shall not commence work under this Contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the Owner, nor shall the Contractor allow any Subcontractor to commence work on this subcontract until the insurance required of the Subcontractor has been so obtained and approved.

a. Worker's Compensation Insurance: The Contractor shall procure and shall maintain during the life of this Contract Worker's Compensation Insurance as required by applicable State or territorial law for all of his

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employees to be engaged in work at the site of the project under this Contract and, in case of any such work sublet, the Contractor shall require the Subcontractor similarly to provide Worker's Compensation Insurance for all of the work unless such employees are covered by the protection afforded by the Contractor's Worker's Compensation Insurance. In case any class of employees engaged in hazardous work on the project under this Contract is not protected under the Worker's Compensation Statute, the Contractor shall provide and shall cause each Subcontractor to provide adequate employer's liability insurance for the protection of such of his employees as are not otherwise protected.

b. Commercial General Liability Insurance and Auto Insurance: The Contractor shall procure and shall maintain during the life of this Contract Commercial General Liability and Auto Liability. The Auto Liability shall cover all owned, non-owned and hired autos. Insurance limits shall be provided in the amounts specified below.

The Contractor's Commercial General Liability Insurance shall have the following limits of \$1,000,000 each occurrence; \$2,000,000 General Aggregate; \$2,000,000 Products/Completed Operations Aggregate and \$1,000,000 Personal and Advertising Injury. This shall be written on a Per Project Basis with coverage being primary/non-contributory and include a 30-day notice. The Auto Liability shall have a \$1,000,000 limit on Each Accident Combined Single Limit.

c. Subcontractor's Commercial General Liability Insurance: The Contractor shall either (1) require each of his Subcontractors to procure and to maintain during the life of his subcontract, Subcontractor's Commercial General Liability and Auto Liability Insurance of the type and in the limits specified in subparagraph (b) hereof, or (2) insure the activities of his policy, specified in subparagraph (b) hereof.

d. Scope of Insurance and Special Hazards: The insurance required under subparagraphs (b) and (c) hereof shall provide adequate protection for the Contractor and his Subcontractor, respectively, against damage claims which may arise from operations under this Contract, whether such operations be by the insured or by anyone directly or indirectly employed by him and, also against any of the special hazards which may be encountered in the performance of this Contract. It is required that the Owner be added as additional insured under the Contractor's, and Subcontractor's Commercial General Liability for both ongoing and completed operations. Completed operations shall be defined as a period of 2 years following final payment. The Owner shall also be listed as additional insured under the Auto Liability and Umbrella Liability. The Commercial General Liability, Auto Liability and Umbrella Liability shall also include a waiver of subrogation for the Owner.

e. Builder's Risk Insurance (Fire Extended Coverage): Until the project is completed and accepted by the Owner, the Contractor is required to maintain Builders risk Insurance (fire and extended coverage) on a 100 percent (100%) completed value basis on the insurable portion of the project (all structures and buildings above grade) for the benefit of the Owner, the Contractor, and the Subcontractors as their interests may appear. This provision shall not release the Contractor from his obligation to complete, according to plans and specifications, the project covered by the Contract, and the Contractor and his Surety shall be obligated to full performance of the Contractor's undertaking.

f. Proof of Carriage Insurance: The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates and date of expiration of policies. Such certificates shall also contain substantially the following statement: "The insurance covered by this certificate will not be cancelled or materially altered, except after (30) days written notice has been received by the Owner.

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g. **Umbrella Liability Coverage:** The Contractor shall provide Umbrella Liability coverage with a limit of liability of not less than \$1,000,000 and shall apply to the Commercial General Liability, Auto Liability and Employers Liability coverage.

h. **Owner's Protective Liability Policy:** The Contractor shall furnish an Owner's Protective Liability Policy which lists the Owner as Named Insured. This insurance coverage shall be provided in a policy separate from the Contractor's insurance policies, and a copy of the policy shall be provided to the Engineer. The limits of liability shall not be less than \$1,000,000.

i. The Contractor hereby agrees to hold harmless, indemnify and defend the Owner, the Owner's agent, Consulting Engineer, and the Owner's employees while acting within the scope of their duties from and against any and all liability, claims, damages and cost of defense arising out of the Contractor's performance of the work described herein but not including the sole negligence of the owner, his agents or employees. The Contractor will require any and all subcontractors to conform with the provisions of this clause prior to commencing any work.

Sample Certificates of Liability follow:

105.30 OMIT

105.31 QUALIFICATIONS FOR EMPLOYMENT

No persons under the age of sixteen (16) years and no person undergoing sentence of imprisonment shall be employed in the development of the Project. No person whose age or physical condition is such as to make his employment dangerous to his health or safety or to the health and safety of others shall be employed in the development of the Project, provided, that this shall not operate against the employment of

physically handicapped persons, otherwise employable, where such persons may be safely assigned to work which they can ably perform.

105.32 NON-REBATE OF WAGES

The Contractor agrees to comply with the regulations, rulings, and interpretations of the Secretary of Labor of the United States pursuant to the Anti-Kickback Act (Title 18, U.S.C., Sec. 874 and Title 40 U.S.C. Sec. 276c) which makes it unlawful to induce any person employed in the construction or repair of public buildings or public works to give up any part of the compensation to which he is entitled under his contract of employment, and the Contractor agrees to insert a like provision in all Sub-Contractors hereunder.

105.33 WAGE CLAIMS AND ADJUSTMENTS

In cases of underpayment of salaries or wages to any engineers, technicians, laborers, or mechanics by the Contractor or any of his Sub-Contractors, the Owner may withhold from such Contractor out of payment due, an amount sufficient to pay persons employed on the work covered by the Contract the difference between the salaries or wages required to be paid under the Contract and the salaries or wages actually paid such employees for the total number of hours worked, and the amounts withheld may be disbursed by the Owner for and on account of the Contractor or the Sub-Contractor to the respective employees to whom they are due. The Owner shall in cases of such underpayment withhold such moneys, provided, that the Owner shall not be considered in default under this sentence if it has in good faith made payments to the Contractor in reliance upon an affidavit of the Contractor that the salaries and wages required under his contract have actually been paid.

105.34 PATENTS

The Contractor shall hold and save the Owner, its officers, and employees, harmless from liability of any nature of kind, including costs and expenses for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the

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performance of the Contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract.

105.35 WARRANTY OF TITLE

No material, supplies or equipment for the work shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. The Contractor warrants good title to all materials, supplies, and equipment installed or incorporated in the work and agrees, upon completion of all work, to deliver the premises together with all improvements and appurtenances constructed or placed thereon by him to the Owner free from any claims, liens, or charges and further agrees that neither he nor any person, firm or corporation furnishing any material or labor for any work covered by this contract shall have any right to a lien upon the premises or any improvement or appurtenance thereon. Nothing contained in this paragraph, however, shall defeat or impair the right of such persons furnishing materials or labor under any bond given by the Contractor for their protection or any rights under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provision of this paragraph shall be inserted in all sub-contracts and material contracts and notice of its provision shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

105.36 GENERAL GUARANTY

Neither the final certificate of payment nor any provision in the Contract nor partial or entire use or occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with the Contract or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall promptly remedy any defect in the work and pay for any damage to other work resulting therefrom which shall appear within a period of one year from the date of final acceptance of the work unless a longer period is specified. The Architect will give notice of observed defects with reasonable promptness.

105.37 LIVE UTILITIES AND OTHER PROPERTY

The Contractor shall assume all responsibility for damage to any property upon, or passing through, the site but excluded from the work or not owned by the Owner, such as utility lines or like items.

105.38 TRUCK WEIGHTS

The weights of trucks hauling materials for this project shall meet the requirements of Chapter 9, Article 2, of Title 32, Code of Alabama, 1975.

105.39 INDEMNIFICATION

a. The Contractor will indemnify and hold harmless the Owner and the Engineer and their agents and employees from and against all claims, damages, losses, and expenses including attorney's fees arising out of or resulting from the performance of the work, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of property including the loss of use resulting therefrom; and is caused in whole or in part by any negligent or willful act or omission of the Contractor, Sub-Contractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

b. In any and all claims against the Owner or the Architect, or any of their agents or employees, by an employee of the Contractor, any Sub-Contractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor or any Sub-Contractor under workmen's compensation acts, disability benefits acts or other employee benefits acts.

105.40 LIMITATIONS ON RESPONSIBILITIES

a. Neither the authority of the Owner or Architect to act under this Section 105, nor any decision made by either of them in good faith either to exercise or not exercise such authority shall give

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rise to any duty or responsibility to the Contractor, Sub-Contractor, any of their agents or employees or any other person performing any of the Work.

b. Neither the Owner nor the Architect will be responsible for the construction means, methods, techniques, sequences or procedures, or the safety precautions and program incident thereto, nor will they be responsible for the Contractor's failure to perform the Work in accordance with the Contract Documents.

c. Neither the Owner nor the Architect will be responsible for the acts or omissions of the Contractor, any Sub-Contractor, any Supplier or any of his or their agents or employees, or any other persons performing or furnishing any of the Work.

d. Whenever in the Contract Documents the terms "as ordered", "as directed", "as required", "as allowed", "as approved" or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "proper" or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of the Owner or Architect as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for compliance with the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to the Owner or Architect any duty or performance of the Work or any duty or authority to undertake responsibilities contrary to the provisions of paragraph 105.41b. or 105.41c.

105.41 SAFETY AND PROTECTION

a. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. All employees on the Work and other persons and organizations who may be affected thereby;

2. All work and materials and equipment to be incorporated therein, whether in storage on or off the site; and

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

b. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property or to their protection from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in paragraph 105.41b. or 105.41c. caused, directly or indirectly in whole or in part, by Contractor, any Sub-Contractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be responsible, shall be remedied by Contractor (except damage or loss attributable to the fault of the Specifications or to the acts or omissions of the Owner or Architect or anyone employed by either of them or anyone for whose acts either of them may be responsible, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor). Contractor's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and accepted by the Owner and Architect.

c. Contractor shall designate a responsible representative at the site whose duty shall be the prevention of accidents. This person shall be Contractor's superintendent unless otherwise designated by Contractor to Owner.

d. EMERGENCIES: In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, Contractor, without special instruction or authorization from the Architect or Owner, shall act immediately to prevent threatened damage, injury or loss. Contractor shall give the Architect and Owner prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If the Architect determines that a change in the Contract Documents is required because of the action taken in response to an emergency, a

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Work Directive Change or Change Order will be issued to document the consequences of the changes or variations.

SCOPE OF WORK

DIVISION 106

DIVISION 106

SCOPE OF WORK

SCOPE OF WORK

106.1 APPLICATION

This scope of work division of the General Specifications is applicable to all work called for by the specifications.

106.1A TIME FOR COMPLETION AND LIQUIDATED DAMAGES

- 1) The work shall commence on the starting time stipulated in the Notice to Proceed and shall be fully completed within **540 calendar days**.
- 1) The liquidated damages for this project shall be **\$500.00 dollars per day** chargeable to the contractor each day the project continues in excess of the allotted time for completion until such time that the project is accepted by the Owner.

106.2 PROJECT SITE

The project site is Elliot Community Center located at 2829 West Meighan Blvd. in Gadsden, Alabama.

106.3 RESPONSIBILITIES OF THE CONTRACTOR

Except as otherwise specifically stated in the General Specifications, the Contractor shall provide and pay for all material, labor, tools, equipment, lights, heat, power, transportation, superintendence, temporary construction of every nature, taxes legally collectible because of the work, and all other necessary services and facilities of every nature whatsoever necessary to execute the work to be done under the Contract and deliver it complete in every respect within required time.

106.4. WORK NOT INCLUDED IN THE CONTRACT

- 1) There is no work shown on the plans that is not included in the contract.

106.5 PROJECT NOTES**General:**

DIVISION 109

FEDERAL-AID FUNDED PROJECTS

FEDERAL-AID FUNDED PROJECTS

Special Provision No. 22-FH0002

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “contractor”) agrees as follows:

1. **Compliance with Regulations:** The contractor will comply with the Acts and Regulations relative to Non-discrimination in Federally- assisted projects, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate either directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set for in Appendix B of 49 C.F.R. Part 21.
3. **Solicitations for Subcontractors, Including Procurements of Materials and Equipment:** In all solicitation, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontractor or supplier will be notified by the contractor of the contractor’s obligations under this contract and the Acts and the Regulations relative to Non-discrimination on the grounds of race, color, or national origin.
4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the Federal Government to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the Recipient or the Federal Government, as appropriate, and will set forth what efforts it has made to obtain the information.
5. **Sanctions for Noncompliance:** In the event of the contractor’s noncompliance with Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it or the Federal Government may determine to be appropriate, including, but not limited to:
 - a. withholding payments to the contractor under the contract until the contractor complies; and/or
 - b. cancelling, terminating, or suspending a contract, in whole or in part.
6. **Incorporating of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the Recipient or the Federal Government may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided that if the contractor becomes involved in, or is threatened with litigation by subcontractor, or supplier as a result of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

FEDERAL-AID FUNDED PROJECTS
Special Provision No. 22-FH0003

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “contractor”) agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

Pertinent Non-Discrimination Authorities:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability); and 49 CFR Part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of the Federal-aid recipients, sub- recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 – 12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38;
- The Federal Aviation Administration’s Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

FEDERAL-AID FUNDED PROJECTS

Special Provision No. 22-FH0004

Required Contract Provision for all Federal Aid Projects for Equal Employment Opportunity

In compliance with Executive Order 11246, the following Standard Federal Equal Opportunity Construction Contract Specifications shall apply:

General Requirements

(41 CFR 60-4.3)

1. As used in these specifications:
 - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
 - a. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
 - b. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return. U.S. Treasury Department Form 941;
 - d. "Minority" includes:
 - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
 - (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent or the Pacific islands); and
 - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract, in excess of \$10,000, the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

FEDERAL-AID FUNDED PROJECTS

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in geographical areas where they do not have a federal or federally-assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are as shown on Attachment No. 1. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.
5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive order 11246, or the regulations promulgated pursuant thereto.
6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:
 - a. Ensure and maintain a working environment free of harassment, intimidation and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
 - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organization's responses.
 - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant, and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the Contractor may have taken.
 - d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
 - e. Develop on-the-job training opportunities and/or participate in training programs for the areas which expressly include minorities and women, including upgrading programs, and apprenticeship and trainee programs, relevant to the Contractor's employment needs, especially those programs funded or approved

FEDERAL-AID FUNDED PROJECTS

by the Department of Labor. The Contractor shall provide notice of these programs to the sources complied under 7b above.

- f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their co-operation in assisting the Contractor in meeting its EEO obligations by including it in any policy manual and collective bargaining agreement, by publicizing it in the company newspaper, annual report, etc., by specific review of the policy with all management personnel and with all minority and female employees at least once a year, and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
- g. Review at least annually the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents, General Foremen, etc. prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
- i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures and tests to be used in the selection process.
- j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.
- k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- l. Conduct at least annually an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- m. Ensure that seniority practices, job classifications, work assignments and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment-related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
- n. Ensure that all facilities and company activities are nonsegregated, except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
- o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
- p. Conduct a review, at least annually, of all supervisors, adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

FEDERAL-AID FUNDED PROJECTS

8. Contractors are encouraged to participate in voluntary associations that assist in fulfilling one or more of their affirmative action obligations (7a through 7p). The efforts of a contractor association, joint contractor-union, contractor-community or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through 7p of these Specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.
9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is under-utilized).
10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex or national origin.
11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of the Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
14. The Contractor shall designate a responsible official to monitor all employment-related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g. mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree existing records satisfy this requirement, contractors shall not be required to maintain separate records.
15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g. those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

Hometown Plans

FEDERAL-AID FUNDED PROJECTS

(41 CFR 60-4.5)

- (a) A contractor participating, either individually or through an association, in an approved Hometown Plan (including heavy highway affirmative action plans) shall comply with its affirmative action obligations under Executive Order 11246 by complying with its obligations under the plan: Provided, that each contractor or subcontractor participating in an approved plan is individually required to comply with the equal opportunity clause set forth in 41 CFR 60-1.4; to make a good faith effort to achieve the goals for each trade participating in the plan in which it has employees; and that the overall good performance by other contractors or subcontractors toward a goal in an approved plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan's goals and timetables. If a Contractor is not participating in an approved Hometown Plan, it shall comply with the Specifications set forth in §60-4.3 of this part and with the goals and timetables for the appropriate area as listed in the Notice required by 41 CFR 4.2 with regard to that trade. For the purposes of this part 60-4, the contractor is not participating in a Hometown Plan for a particular trade if it:
- (1) Ceases to be signatory to a Hometown Plan covering that trade;
 - (2) Is signatory to a Hometown Plan for that trade but is not party to a collective bargaining agreement for that trade;
 - (3) Is signatory to a Hometown Plan for that trade but is party to a collective bargaining agreement with labor organizations which are not or cease to be signatories to the same Hometown Plan for that trade;
 - (4) Is signatory to a Hometown Plan for that trade and is party to a collective bargaining agreement with labor organization for that trade but the two have not jointly executed a specific commitment to minority and female goals and timetables and incorporated the commitment in the Hometown Plan for that trade;
 - (5) Is participating in a Hometown Plan for that trade which is no longer acceptable to the Office of Federal Contract Compliance Programs;
 - (6) Is signatory to a Hometown Plan for that trade but is party to a collective bargaining agreement with a labor organization for that trade and the labor organization and the contractor have failed to make a good faith effort to comply with their obligations under the Hometown Plan for that trade.
- (b) Contractors participating in Hometown Plans must be able to demonstrate their participation and document their compliance with the provisions of the Hometown Plan.

Solicitations

(41 CFR 60-4.2)

- (d) The following notice shall be included in, and shall be a part of, all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts in excess of \$10,000 to be performed in geographical areas designated by the Director pursuant to §60-4.6 of this part (see 41 CFR-4.2 (a)):

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)

1. The Offeror's or Bidder's attention is called to the "Equal opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as shown on Attachment No. 1.

FEDERAL-AID FUNDED PROJECTS

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally-involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Employment Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.
4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is that shown on Attachment No. 1.

Show Cause Notice

(41 CFR 60-4.8)

If an investigation or compliance review reveals that a construction contractor or subcontractor has violated the Executive Order, any contract clause, specifications or the regulations in this chapter and if administrative enforcement is contemplated, the Director shall issue to the contractor or subcontractor a notice to show cause which shall contain the items specified in (i) - (iv) of 41 CFR 60-2.2 (c)(1) - If the Contractor does not show good cause within 30 days, or, in the alternative, fails to enter an acceptable conciliation agreement which includes where appropriate, make-up goals and timetables, back pay, and seniority relief for affected class members, the compliance agency shall follow the procedure in 41 CFR 60-1.26(b) : Provided that where a conciliation agreement has been violated, no show cause notice is required prior to the initiation of enforcement proceedings.

FEDERAL-AID FUNDED PROJECTS

Attachment No. 1**Goals & Timetables**

(41 CFR 60-4.2)

The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

FEMALE

Area Covered – Statewide

Timetable: Until Further Notice

Trade: All

Goals: 6.9%

MINORITY

Area Covered – Etowah County

Timetable: Until Further Notice

Trade: All

Goals: 24.9%

Form DBE 10 Instructions

Revised 5-2015

Block	Number	Instructions
	1.	Project Number
	2.	County
	3.	Region
	4.	Prime Contractor For the Project
	5.	DBE for this Report
	6.	Date of Report
	7.	Estimate Number
	8.	Work Period for this Estimate (Beginning Date - Ending Date)
	9.	Description of Work - Must include Pay Item No. and Description (Also denote if Partial such as Hauling, Stocking, Furnish & Tie, S.I.P. Forms, etc.)
	10.	Type of DBE, i.e. Contractor (C), Supplier (S), Manufacturer (M), or Brokerage/Fee (BF) work
	11.	Unit Price of Work
	12.	Units
	13.	Units of Work Accomplished this Period
	14.	Amount Performed for this Period (Block 11 times Block 13)
	15.	Units Performed to Date
	16.	Amount Performed to Date (Block 11 times Block 15)
	17.	Comments Pertinent to this DBE-10
	18.	Total of Amounts in Block 14
	19.	Total of Amounts in Block 16
	20.	Signature of Prime Contractor's Authorized Representative, Printed Name & Title and Date Signed

Submittals:

- 1) Invoices are required for all supplier and manufacturer credit.
- 2) Tickets are required for all "Stocking the Plant" hauling.
- 3) In lieu of completing the form, the prime contractor may note "See attached" on the form and attach a similar form (i.e. subcontractor estimate) provided it has the same data. If the contractor chooses to do this, he will have to adjust the credit on the actual DBE-10 if the DBE is a supplier.

FORM DBE-10

1. Project Number:				2. County:			3. Region:	
4. Prime Contractor:				5. DBE:				
6. Date:		7. ALDOT Estimate:		8. Estimate Period: From: To:				
9. Description of Work: (Pay Item No. & Description)								
10. Type Firm (C/S/M/BF)								
Pay Item No.	Item Description		11. Unit Price	12. Units	13. Units Worked	14. Amount Performed this Period	15. Units Performed to Date	16. Amount Performed to Date
17. Comments:						18. Total:		19. Total:
20. Signature of Authorized Representative:				Printed Name & Title			Date Signed	

Certification of Actual Payments to DBE Firms

Project No.: _____

County: _____

1. The undersigned prime contractor on the above referenced Federal Aid Project No. hereby certifies that full payment was made, or will be made within seven (7) calendar days after final payment, to the DBE firm listed for work performed and/or materials furnished under this project's contract as follows:

DBE Firm Name: _____

was or will be paid \$ _____

Note: this amount does / does not include gross receipts tax and bond.
(circle one) (circle if applicable)

This certification is made under Federal and State laws concerning false statements. Supporting documentation for this payment is subject to audit and should be retained for a minimum of three (3) years from the final acceptance date.

If the DBE Subcontractor/Supplier works for a Non-DBE Subcontractor under the Prime Contractor, the Non-DBE Subcontractor must also complete the form.

Prime Contractor	Non-DBE Subcontractor
By: _____ signature	_____ signature
Name: _____ please print	_____ please print
Title: _____	_____
Date: _____	_____

2. The undersigned subcontractor/supplier for the above-named project hereby certifies that payments were received, or are due to be received as stipulated above.

DBE Subcontractor/Supplier _____

By: _____

signature

Name: _____

please print

Title: _____

Date: _____

THIS FORM IS TO BE COMPLETED AND RETURNED WITH YOUR EXECUTED CONTRACT

AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY

Statement Required To Be Submitted By Proposed Contractor Pursuant To Notice Of Requirement For Affirmative Action To Ensure Equal Employment Opportunity (Executive Order 11246) And Regulation In 41 CFR Part 60-4 On All Federal And Federally Assisted Contracts In Excess of \$10,000.

Project Number: _____

County: _____

Contractor: _____

Mailing Address: _____
Street City State Zip

Telephone Number: _____
A.C.

Employer Identification Number: _____

"Employer Identification Number" means the Federal Social Security Number used on the Employer's Quarterly Federal Tax Return, U. S. Treasury Department Form 941.

Amount of Contract: \$ _____

Estimated Starting Date: _____ Estimated Completion Date: _____

Signed: _____ Date: _____
Contractor's Representative

NOTE: If more than one contractor firm is involved, a copy of this statement shall be completed by each contractor and returned with the executed contract.

Additional Contract Clauses Required for Federal-Aid Funded Projects

1. Purchases of American Made Equipment and Products

- a. **Buy American Act:** As stated in Section 507 of Public Law 103-333, it is the sense of Congress that to the extent practicable, all equipment and product purchases with funds from this Agreement should be American made.
- b. **Buy America Act:** The Contractor agrees to abide by the Buy America Act (23 U.S.C. Subpart 313) and FHWA's related regulatory policy found in 23 C.F.R. Subpart 635.410.

2. Termination of Agreement

- a. A clause addressing a termination for cause and convenience must be included in all contracts in excess of \$10,000. The following provisions apply to termination under this grant agreement. The performance of work under this agreement may be terminated in whole or in part for the following circumstances:
 - i. **Termination for Convenience.** This Agreement may be terminated by the Owner with thirty (30) days written notice. Said notice shall specify the reasons for requesting such termination. If the Owner determines that continuation of the work will serve no useful public purpose, then this Agreement may be terminated by the Owner, at which time the contractor shall be entitled to necessary expenses incurred through the date of termination.
 - ii. **Termination for Cause.** If, through any cause, the Contractor shall fail to fulfill in a timely manner its obligations under this Agreement, or if the Contractor shall violate any of the covenants, agreements, or stipulations of this contract, and such failure or violation is not corrected within fifteen (15) calendar days after such notice is given by the Owner to the Contractor, then the Owner shall thereupon have the right to immediately terminate or suspend this contract by giving written notice to the Contractor of such termination or suspension and specifying the effective date thereof.
 - iii. In the event of termination, either for convenience or for cause, the contractor shall be entitled to just and equitable compensation for any satisfactory work completed by the effective date.
 - iv. Notwithstanding the above, the Contractor shall not be relieved of liability to the Owner for damages sustained by the Owner by virtue of any breach of

the contract by the Contractor, and the Owner may withhold payments to the Contractor for the purpose of setoff until such time as the exact amount of damages due the Owner from the Contractor is determined.

3. Discrimination.

- a. The Contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award of and administration of Federal-Aid assisted contracts. Failure by contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy, as the Owner deems appropriate.

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Nondiscrimination
- III. Non-segregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
- XI. Certification Regarding Use of Contract Funds for Lobbying
- XII. Use of United States-Flag Vessels:

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under title 23, United States Code, as required in 23 CFR 633.102(b) (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services). 23 CFR 633.102(e).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider. 23 CFR 633.102(e).

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services) in accordance with 23 CFR 633.102. The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in solicitation-for-bids or request-for-proposals documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract). 23 CFR 633.102(b).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work

performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract. 23 CFR 633.102(d).

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. 23 U.S.C. 114(b). The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors. 23 U.S.C. 101(a).

II. NONDISCRIMINATION (23 CFR 230.107(a); 23 CFR Part 230, Subpart A, Appendix A; EO 11246)

The provisions of this section related to 23 CFR Part 230, Subpart A, Appendix A are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR Part 60, 29 CFR Parts 1625-1627, 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR Part 60, and 29 CFR Parts 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR Part 230, Subpart A, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal Employment Opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (see 28 CFR Part 35, 29 CFR Part 1630, 29 CFR Parts 1625-1627, 41 CFR Part 60 and 49 CFR Part 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140, shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR Part 35 and 29 CFR Part 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract. 23 CFR 230.409 (g)(4) & (5).

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, sexual orientation, gender identity, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action or are substantially involved in such action, will be made fully cognizant of and will implement the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable company official.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to ensure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action

within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs (i.e., apprenticeship and on-the-job training programs for the geographical area of contract performance). In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. 23 CFR 230.409. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide

sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants /

Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established thereunder. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:

The contractor shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors, suppliers, and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurances Required:

a. The requirements of 49 CFR Part 26 and the State DOT's FHWA-approved Disadvantaged Business Enterprise (DBE) program are incorporated by reference.

b. The contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:

- (1) Withholding monthly progress payments;
- (2) Assessing sanctions;
- (3) Liquidated damages; and/or
- (4) Disqualifying the contractor from future bidding as non-responsible.

c. The Title VI and nondiscrimination provisions of U.S. DOT Order 1050.2A at Appendixes A and E are incorporated by reference. 49 CFR Part 21.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women.

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of more than \$10,000. 41 CFR 60-1.5.

As prescribed by 41 CFR 60-1.8, the contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location under the contractor's control where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size), in accordance with 29 CFR 5.5. The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. 23 U.S.C. 113. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. 23 U.S.C. 101. Where applicable law requires that projects be treated as a project on a Federal-aid highway, the provisions of this subpart will apply regardless of the location of the project. Examples include: Surface Transportation Block Grant Program projects funded under 23 U.S.C. 133 [excluding recreational trails projects], the Nationally Significant Freight and Highway

Projects funded under 23 U.S.C. 117, and National Highway Freight Program projects funded under 23 U.S.C. 167.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages (29 CFR 5.5)

a. All laborers and mechanics employed or working upon the site of the work, 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 paragraph 1.d. of this section; 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 particular 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 on 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 paragraph 1.b. of this section) 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.

b.(1) The contracting officer shall require that 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. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer 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 the contracting officer to the Administrator of the Wage and Hour Division, 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 the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

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

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. 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.

d. 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.

2. Withholding (29 CFR 5.5)

The contracting agency 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 on the site of the work, all or part of the wages required by the contract, the contracting agency 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.

3. Payrolls and basic records (29 CFR 5.5)

a. 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 at the site of the work. 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 any 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.

b.(1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency.

(2) 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:

(i) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;

(ii) 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;

(iii) 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.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, 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, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, 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.

4. Apprentices and trainees (29 CFR 5.5)

a. Apprentices (programs of the USDOL).

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 Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, 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 the Office of Apprenticeship Training, Employer and Labor Services 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 above, 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 journeymen 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 determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, 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.

b. Trainees (programs of the USDOL).

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 on 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 on 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 on 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 on 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.

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

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. 23 CFR 230.111(e)(2). The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract as provided in 29 CFR 5.5.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. 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 as provided in 29 CFR 5.5.

9. Disputes concerning labor standards. As provided in 29 CFR 5.5, disputes arising out of the labor standards provisions of this contract 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 contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility (29 CFR 5.5)

a. 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 Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract 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.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

Pursuant to 29 CFR 5.5(b), the following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. 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 shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty 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 forty hours in such workweek. 29 CFR 5.5.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph 1 of this section, 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 clause set forth in paragraph 1 of this section, in the sum currently provided in 29 CFR 5.5(b)(2)* for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1 of this section. 29 CFR 5.5.

* \$27 as of January 23, 2019 (See 84 FR 213-01, 218) as may be adjusted annually by the Department of Labor; pursuant to the Federal Civil Penalties Inflation Adjustment Act of 1990).

3. Withholding for unpaid wages and liquidated damages.

The FHWA or the contracting agency 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 other 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 clause set forth in paragraph 2 of this section. 29 CFR 5.5.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs 1 through 4 of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1 through 4 of this section. 29 CFR 5.5.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System pursuant to 23 CFR 635.116.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" in paragraph 1 of Section VI refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions: (based on longstanding interpretation)

- (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
- (2) the prime contractor remains responsible for the quality of the work of the leased employees;
- (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
- (4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or

equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract. 23 CFR 635.102.

2. Pursuant to 23 CFR 635.116(a), the contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. Pursuant to 23 CFR 635.116(c), the contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract. (based on long-standing interpretation of 23 CFR 635.116).

5. The 30-percent self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements. 23 CFR 635.116(d).

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR Part 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract. 23 CFR 635.108.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR Part 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704). 29 CFR 1926.10.

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance

with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR Part 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 11, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT (42 U.S.C. 7606; 2 CFR 200.88; EO 11738)

This provision is applicable to all Federal-aid construction contracts in excess of \$150,000 and to all related subcontracts. 48 CFR 2.101; 2 CFR 200.326.

By submission of this bid/proposal or the execution of this contract or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, subcontractor, supplier, or vendor agrees to comply with all applicable standards, orders

or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal Highway Administration and the Regional Office of the Environmental Protection Agency. 2 CFR Part 200, Appendix II.

The contractor agrees to include or cause to be included the requirements of this Section in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements. 2 CFR 200.326.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200. 2 CFR 180.220 and 1200.220.

1. Instructions for Certification – First Tier Participants:

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction. 2 CFR 180.320.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default. 2 CFR 180.325.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances. 2 CFR 180.345 and 180.350.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900-180.1020, and 1200. "First Tier Covered Transactions" refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant

who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first 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 debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction. 2 CFR 180.330.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold. 2 CFR 180.220 and 180.300.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. 2 CFR 180.300; 180.320, and 180.325. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. 2 CFR 180.335. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (<https://www.sam.gov/>). 2 CFR 180.300, 180.320, and 180.325.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is 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 may terminate this transaction for cause or default. 2 CFR 180.325.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.335;.

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property, 2 CFR 180.800;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification, 2 CFR 180.700 and 180.800; and

(4) 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 CFR 180.335(d).

(5) Are not a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(6) Are not a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability (USDOT Order 4200.6 implementing appropriations act requirements).

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal. 2 CFR 180.335 and 180.340.

3. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders, and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200). 2 CFR 180.220 and 1200.220.

a. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

b. 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.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances. 2 CFR 180.365.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900 – 180.1020, and 1200. You may contact the person to which this proposal is

submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contractor). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. 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 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. 2 CFR 1200.220 and 1200.332.

f. 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 exceeding the \$25,000 threshold. 2 CFR 180.220 and 1200.220.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (<https://www.sam.gov/>), which is compiled by the General Services Administration. 2 CFR 180.300, 180.320, 180.330, and 180.335.

h. 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 participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is 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. 2 CFR 180.325.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals:

(a) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.355;

(b) is a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(c) is a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. (USDOT Order 4200.6 implementing appropriations act requirements)

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal.

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000. 49 CFR Part 20, App. A.

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with 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, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than 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 Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier

subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

XII. USE OF UNITED STATES-FLAG VESSELS:

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, or any other covered transaction. 46 CFR Part 381.

This requirement applies to material or equipment that is acquired for a specific Federal-aid highway project. 46 CFR 381.7. It is not applicable to goods or materials that come into inventories independent of an FHWA funded-contract.

When oceanic shipments (or shipments across the Great Lakes) are necessary for materials or equipment acquired for a specific Federal-aid construction project, the bidder, proposer, contractor, subcontractor, or vendor agrees:

1. To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels. 46 CFR 381.7.
2. To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b)(1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Office of Cargo and Commercial Sealift (MAR-620), Maritime Administration, Washington, DC 20590. (MARAD requires copies of the ocean carrier's (master) bills of lading, certified onboard, dated, with rates and charges. These bills of lading may contain business sensitive information and therefore may be submitted directly to MARAD by the Ocean Transportation Intermediary on behalf of the contractor). 46 CFR 381.7.

**ATTACHMENT A - EMPLOYMENT AND MATERIALS
PREFERENCE FOR APPALACHIAN DEVELOPMENT
HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS
ROAD CONTRACTS (23 CFR 633, Subpart B, Appendix B)**

This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

A. APPLICABILITY

The Project or Program to which the construction work covered by this Contract pertains is being assisted by the United States of America, and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

(1) MINIMUM WAGES

- (i) All laborers and mechanics employed or working upon the site of the work 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 particular 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 on 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 (WH1321)) 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.

(ii) Additional Classifications.

- (A) Any class of laborers or mechanics 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 the following criteria have been met:
- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination;
 - (2) The classification is utilized in the area by the construction industry; and
 - (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- (B) If the contractor, the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the proposed 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 ("Administrator"), Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 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. (Approved by the Office of Management and Budget ("OMB") under OMB control number 1235-0023.)
- (C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, or 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 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. (Approved by the Office of Management and Budget under OMB Control Number 1235-0023.)

(D) The wage rate (including fringe benefits, where appropriate) determined pursuant to subparagraphs (1)(ii)(B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this Contract from the first day on which work is performed in the classification.

(iii) 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.

(iv) 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. (Approved by the Office of Management and Budget under OMB Control Number 1235-0023.)

(2) **Withholding.** HUD or its designee shall, upon its own action or upon written request of an authorized representative of the U.S. 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 on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, 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. The U.S. Department of Labor shall make such disbursements in the case of direct Davis-Bacon Act contracts.

(3) Payrolls and basic records.

(i) **Maintaining Payroll Records.** 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 at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification(s), 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 any 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. (Approved by the Office of Management and Budget under OMB Control Numbers 1235-0023 and 1215-0018)

(ii) Certified Payroll Reports.

(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, 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 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead, the payrolls only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <https://www.dol.gov/agencies/whd/forms> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the U.S. Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1235-0008.)

- (B) 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:
- (1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;
 - (2) 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;
 - (3) 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; and
- (C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph (a)(3)(ii)(b).
- (D) 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.
- (iii) The contractor or subcontractor shall make the records required under subparagraph (a)(3)(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the U.S. 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, sponsor, applicant, or owner, 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.

(4) Apprentices and Trainees.

- (i) **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 Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, 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 the Office of Apprenticeship Training, Employer and Labor Services, 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 above, 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 journeymen 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 determines that a different practice prevails for the applicable apprentice classification, fringe benefits shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, 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.

- (ii) **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 on 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 on 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 on the wage determination for the 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 on 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.

- (iii) **Equal employment opportunity.** The utilization of apprentices, trainees, and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

- (5) **Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this Contract.
- (6) **Subcontracts.** The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs (1) through (11) in this paragraph (a) and such other clauses as HUD or its designee may, by appropriate instructions, require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.
- (7) **Contract termination; debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.
- (8) **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.
- (9) **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the U.S. 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 HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.
- (10) **Certification of Eligibility.**
- (i) 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 Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

- (ii) No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.
- (iii) Anyone who knowingly makes, presents, or submits a false, fictitious, or fraudulent statement, representation or certification is subject to criminal, civil and/or administrative sanctions, including fines, penalties, and imprisonment (e.g., 18 U.S.C. §§ 287, 1001, 1010, 1012; 31 U.S.C. §§ 3729, 3802).

(11) Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic, to whom the wage, salary, or other labor standards provisions of this Contract are applicable, shall be discharged or in any other manner discriminated against by the contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The provisions of this paragraph (b) are applicable where the amount of the prime contract exceeds **\$100,000**. 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, 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 clause set forth in subparagraph B(1) of this paragraph, 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 clause set forth in subparagraph B(1) of this paragraph, **in the sum set by the U.S. Department of Labor at 29 CFR 5.5(b)(2)** 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 the clause set forth in subparagraph B(1) of this paragraph. In accordance with the Federal Civil Penalties Inflation Adjustment Act of 1990 (28 U.S.C. § 2461 Note), the DOL adjusts this civil monetary penalty for inflation no later than January 15 each year.
- (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 U.S. 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 other Federal contract with the same prime contract, 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 clause set forth in subparagraph B(2) of this paragraph.
- (4) Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph B(1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs B(1) through (4) of this paragraph.

C. HEALTH AND SAFETY

The provisions of this paragraph (c) are applicable where the amount of the prime contract exceeds **\$100,000**.

- (1)** No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his or her health and safety, as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.
- (2)** The contractor shall comply with all regulations issued by the Secretary of Labor pursuant to 29 CFR Part 1926 and 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.
- (3)** The contractor shall include the provisions of this paragraph in every subcontract, so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.



U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, DC 20410-0050

Special Attention of:

Office of Davis-Bacon and Labor Standards Regional and Field Staff;
Office of Multifamily Housing Program Directors;
Office of Residential Care Facilities Directors;
Office of Community Planning and Development Directors;
CDBG and HOME Grantees;
Public Housing Regional and Office Directors;
Public Housing Agencies;
Office of Native American Programs Administrators;
Tribes; Tribally Designated Housing Entities;
Indian Housing Authorities

Notice: LR-22-02

Issued: 07/01/2022

Expires: This Notice is effective until it is amended, superseded, or rescinded.

Supersedes: LR-09-01

Cross References: HUD Handbook, 1344.1; Davis Bacon Act; Davis-Bacon Related Acts; DOL Regulations 29 CFR Parts 1, 3, 5, 6, and 7; DOL All Agency Memoranda 130, 131, and 236; DOL Field Operations Handbook

SUBJECT: HUD guidance on determining Davis-Bacon applicability to early construction and covered demolition work.

I. PURPOSE

The purpose of this Notice is to provide guidance on the determination of Davis-Bacon wage requirements to HUD staff and program participants for *early construction* performed on HUD financed or assisted projects subject to Davis-Bacon and the Related Acts (DBRA), and to provide guidance on the determination of Davis-Bacon wage requirements on certain demolition work conducted in relation to covered HUD program activity, usually with Local Contracting Agencies (LCAs).

This Notice also provides guidance concerning character of work determinations and lock-in dates where work is covered by Davis-Bacon requirements.

II. BACKGROUND

Early construction specifically relates to necessary work performed as a condition of or a requirement for a project subject to DBRA to proceed. This work may or may not be a part of the main construction contract and may include, but is not limited to, site preparation/clearing, demolition, lead-based paint removal, and/or asbestos abatement. However, *early construction* does not include operations work and contracts, including routine and nonroutine maintenance work, that is otherwise subject to HUD-determined maintenance wage rates.

Demolition on LCA projects, by itself, is not necessarily considered to be *construction, alteration, or repair* (i.e., activities to which Davis-Bacon requirements may apply) and typically does not trigger DBRA *unless* it will be followed by Davis-Bacon-covered construction, whether the demolition is financed or assisted with HUD program funds or with other (non-HUD) funding. If subsequent construction at the site is planned—as part of the same contract, or if subsequent construction is contemplated, as part of a future construction project—then the demolition work is considered to be part of the overall construction project.

In such cases, if the subsequent construction work is subject to Davis-Bacon requirements, then the demolition would likewise be covered by Davis-Bacon requirements. Davis-Bacon requirements apply to demolition work where such requirements are imposed by statutory provisions that specify demolition as a Davis-Bacon-covered activity.¹

Davis-Bacon coverage of demolition, in the context of HUD program activity, would necessarily involve knowledge that there will be subsequent construction *and* that the subsequent construction work will be covered by Davis-Bacon. This knowledge, whether of planned or contemplated construction work, implies that there is documented evidence of the expected subsequent construction. Such evidence may include contract specifications; disposition plans; budgets; applications for assistance; and similar records.

III. DETERMINING THE APPLICABLE WAGE DECISION, CHARACTER OF CONSTRUCTION AND LOCK-IN DATES

When *early construction* occurs on a project subject to DBRA requirements and where mechanics and laborers are on the jobsite performing work before initial endorsement or main contract award, that work may be subject to DBRA requirements.² For wage determination purposes, a project consists of all the construction necessary to complete a facility regardless of the number of contracts involved, so long as all the contracts awarded are closely related in purpose, time, and place.³

The U.S. Department of Labor's (DOL) guidance on selecting a wage rate decision or multiple wage rate decisions will continue to apply for *early construction*. Once *early construction* is identified, and the character(s) of construction and the appropriate wage rate decision(s) have been selected, the wage decision locks-in when the early construction begins. Once locked-in, the rates will be effective for the entire project.⁴

In terms of demolition and work covered by Davis-Bacon wage requirements, determining the character of work is established by the *end result* of the work at that site. Demolition will take the project's end result primary category of construction: "residential" (single-family homes or apartments four stories or less); "building" (e.g., apartment buildings of more than four stories, or an office building, parking garage, or community center); "highway" (e.g., a parking lot, streets, or sidewalks); or "heavy" (e.g., an outdoor swimming pool).⁵

When it is known that the demolition will be later followed by Davis-Bacon-covered construction work, but the character of the end result is not yet determined, a "heavy" wage decision is applicable.

¹ DOL Field Operations Handbook (FOH) 15d03(a) and (b) and HUD Handbook 1344.1 (rev. 2) Federal Labor Standards Requirements in HUD Programs, Chapter 11, 11-8 (A), (B), and (C).

² For FHA projects, work done prior to application is not subject to Davis-Bacon prevailing wage requirements.

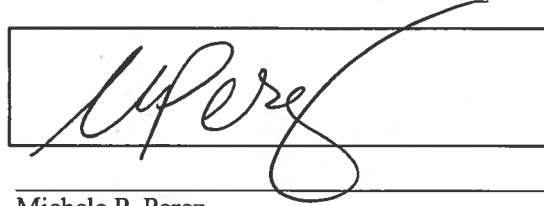
³ DOL All Agency Memoranda 130 and 131

⁴ DOL All Agency Memoranda 130, 131, and 236

⁵ Ibid.

V. CONTACTS

If you have questions about this Notice, contact the DBLS staff with jurisdiction in your area. A list of DBLS contacts is available on the national webpage.⁶



Michele P. Perez
Assistant Deputy Secretary
Office of Field Policy and Management

⁶ Find your local DBLS contact at https://www.hud.gov/program_offices/davis_bacon_and_labor_standards/laborrelstf



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

PRODUCER	CONTACT NAME:	
	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	
	NAIC #	
INSURED	INSURER A :	
	INSURER B :	
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

CERTIFICATE NUMBER:

REVISION NUMBER:

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

EXCLUSIONS AND CONDITIONS OF COVERAGE: LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.									
INSR LTR	TYPE OF INSURANCE			ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
	<input checked="" type="checkbox"/>	COMMERCIAL GENERAL LIABILITY							
	<input type="checkbox"/>	CLAIMS-MADE	<input checked="" type="checkbox"/> OCCUR						EACH OCCURRENCE \$ 1,000,000
	<input type="checkbox"/>								DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 100,000
	<input type="checkbox"/>								MED EXP (Any one person) \$ 5,000
	GEN'L AGGREGATE LIMIT APPLIES PER:								PERSONAL & ADV INJURY \$ 1,000,000
	<input type="checkbox"/>	POLICY	<input checked="" type="checkbox"/> PROJECT	<input type="checkbox"/>	LOC				GENERAL AGGREGATE \$ 2,000,000
	<input type="checkbox"/>	OTHER:							PRODUCTS - COMP/OP AGG \$ 2,000,000
									\$
		AUTOMOBILE LIABILITY							COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000
	<input checked="" type="checkbox"/>	ANY AUTO							BODILY INJURY (Per person) \$
	<input type="checkbox"/>	OWNED AUTOS ONLY	<input type="checkbox"/> SCHEDULED AUTOS						BODILY INJURY (Per accident) \$
	<input type="checkbox"/>	HIRED AUTOS ONLY	<input type="checkbox"/> NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident) \$
									\$
	<input checked="" type="checkbox"/>	UMBRELLA LIAB	<input checked="" type="checkbox"/> OCCUR						EACH OCCURRENCE \$ 1,000,000
		EXCESS LIAB	<input type="checkbox"/> CLAIMS-MADE						AGGREGATE \$ 1,000,000
	<input type="checkbox"/>	DED	RETENTION \$						\$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY								<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTHER
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH)			<input type="checkbox"/> Y/N	N/A				E.L. EACH ACCIDENT \$ 1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below								E.L. DISEASE - EA EMPLOYEE \$ 1,000,000
									E.L. DISEASE - POLICY LIMIT \$ 1,000,000

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

CANCELLATION

<p>CITY-54</p> <p>City of Gadsden 90 Broad Street Gadsden, AL 35901</p>	<p>CANCELLATION</p> <p>SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.</p>
	<p>AUTHORIZED REPRESENTATIVE</p>



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

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

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

PRODUCER	CONTACT NAME:		
	PHONE (A/C, No, Ext):	FAX (A/C, No):	
	E-MAIL ADDRESS:		
	INSURER(S) AFFORDING COVERAGE		NAIC #
	INSURER A:		
	INSURER B:		
	INSURER C:		
INSURED OWNER AND CONTRACTOR	INSURER D:		
	INSURER E:		
	INSURER F:		

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

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

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
	COMMERCIAL GENERAL LIABILITY						
	<input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> OCCUR						EACH OCCURRENCE \$ 1,000,000
X	OCP						DAMAGE TO RENTED PREMISES (Ea occurrence) \$
							MED EXP (Any one person) \$
	GEN'L AGGREGATE LIMIT APPLIES PER:						PERSONAL & ADV INJURY \$
	<input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC						GENERAL AGGREGATE \$ 1,000,000
	OTHER:						PRODUCTS - COMP/OP AGG \$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident) \$
	<input type="checkbox"/> ANY AUTO OWNED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS						BODILY INJURY (Per person) \$
	<input type="checkbox"/> HIRED AUTOS ONLY <input type="checkbox"/> NON-OWNED AUTOS ONLY						BODILY INJURY (Per accident) \$
							PROPERTY DAMAGE (Per accident) \$
	UMBRELLA LIAB <input type="checkbox"/> OCCUR						EACH OCCURRENCE \$
	EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE						AGGREGATE \$
	DED <input type="checkbox"/> RETENTION \$						\$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY						<input type="checkbox"/> PER STATUTE <input type="checkbox"/> OTH-ER
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) <input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A						E.L. EACH ACCIDENT \$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE \$
							E.L. DISEASE - POLICY LIMIT \$

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

CERTIFICATE HOLDER**CANCELLATION**

CITY-54

City of Gadsden
90 Broad Street
Gadsden, AL 35901

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

AUTHORIZED REPRESENTATIVE

SECTION 01020 - ALLOWANCES1.01 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 the handling and processing of allowances.
 - (1) Types of Allowances required include the following:
 - (a) **LUMP SUM ALLOWANCES**
 - (b) **CONTINGENCY ALLOWANCE**
 - (2) Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. Additional requirements, if necessary, will be issued by Change Order.
- B. At Project Close-out, credit any unused amounts remaining in each Allowance to the Owner by Change Order. Approved amounts in excess of the Allowance will be added by Change Order.
 - (1) Any credits or additions to the Contract Sum will be calculated using the Contractor's Unit Prices, as quoted on the Bid Form.
- C. Related Sections:
 - (1) BID FORM, for Unit Prices to be included in the bid.
 - (2) Section 01026 "Unit Prices" for administrative and procedural requirements for unit prices.
 - (3) Section 01400 "Quality Control Services" for administrative and procedural requirements for quality control services.

1.03 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed for the Owner=s purposes, and only by Change Orders which designate amounts to be charged to the allowance.
- B. The Contractor=s related costs for products or equipment ordered by the Owner under the contingency allowance, including delivery, installation, taxes, insurance, equipment rental, and similar costs are not part of the Contract Sum.
- C. Change Orders authorizing use of funds from the contingency allowance will include the Contractor=s related costs and reasonable overhead and profit margins.
- D. At Project Closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.04 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.

1.05 SUBMITTALS

- A. When requested by the Architect, obtain proposals for each Allowance for use in making final decisions; include recommendations that are relevant to performance of the Work.
- B. Submit invoices to indicate actual quantities of materials or services provided, in fulfillment of each Allowance.

PART 2 - PRODUCTS (not used)

PART 3 – EXECUTION

3.01 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance items is completely integrated and interfaced with related construction activities, including coordination required for phased construction.

3.02 SCHEDULE OF ALLOWANCES

ALLOWANCE NO. 1 – UNDERCUT & NEW ENGINEERED FILL ALLOWANCE, as follows:

Include in the Base Bid a lump sum amount of **(to be issued by Addendum)** for undercutting/disposal of unsuitable soils and replacement with new engineered fill (compacted-in place). See Section 312000 for specific earthwork requirements. Where unstable soils are encountered, final cost shall be calculated using Unit Price quoted on Contractor's Bid Form.

- A. See Reports of Subsurface Exploration and Geotechnical Evaluation, **(to be issued by Addendum)**, for recommended extent and depths of undercut at new building area, and at new pavements (for determining Base Bid quantities).
- B. For purposes of this Allowance, the final volume of undercut & new engineered fill shall be calculated beginning at the existing subgrade elevations, as indicated on the Existing Site Plan on the Civil Drawings – after removal of topsoil. See Geotechnical Reports for average topsoil depths.

ALLOWANCE NO. 2 – OWNER'S CONTINGENCY ALLOWANCE, as follows:

Include a contingency allowance of **FORTY THOUSAND DOLLARS (\$40,000.00)** for use upon the Owner's instructions.

END OF SECTION 01020

SECTION 01026 - UNIT PRICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Division 1 Specification sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for unit prices.
 - (1) A unit price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased.
 - (2) Refer to the individual Specification Sections for construction activities requiring the establishment of unit prices.
- B. Schedule: A "Unit Price Schedule" is included on the Bid Form. Specification Sections contain requirements for materials and methods described under each unit price.
 - (1) The Owner reserves the right to reject the Contractor's measurement of work-in-place that involves use of established unit prices, and to have this Work measured by an independent surveyor acceptable to the Contractor at the Owner's expense.

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION

3.01 UNIT PRICE SCHEDULE

- A. SEE BID FORM

END OF SECTION 01026

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Division 1 Specification Sections, apply to work of this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
 - (1) Pre-Construction Conference.
 - (2) Pre-Installation Conferences.
 - (3) Pre-Roofing Conference.
 - (4) Progress Meetings.

1.03 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: The Owner, the State Building Commission Field Inspector, the Architect and its Consultants, the Contractor and its Superintendent, Major Subcontractors, Manufacturers, Suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.
- C. Agenda: Discuss items of significance that could affect progress including such topics as:
 - Tentative construction schedule.
 - Critical work sequencing.
 - Designation of responsible personnel.
 - Procedures for processing field decisions and Change Orders.
 - Procedures for processing Applications for Payment.
 - Distribution of Contract Documents.
 - Submittal of Shop Drawings, Product Data and Samples.
 - Preparation of record documents.
 - Use of the premises.
 - Office, Work and Storage areas.
 - Equipment deliveries and priorities.
 - Safety procedures.
 - First Aid.
 - Security.
 - Housekeeping.
 - Working Hours.

1.04 PRE-INSTALLATION CONFERENCES

- A. Conduct a pre-installation conference at the site before each major construction activity that requires coordination with other construction. The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Owner and Architect of scheduled meeting dates.

- B. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:
- Contract Documents.
 - Options.
 - Related Change Orders.
 - Purchases.
 - Deliveries.
 - Shop Drawings, Product Data and quality control samples.
 - Possible conflicts.
 - Compatibility problems.
 - Time schedules.
 - Weather limitations.
 - Manufacturer=s recommendations.
 - Compatibility of materials.
 - Acceptability of substrates.
 - Temporary facilities.
 - Space and access limitations.
 - Governing regulations.
 - Safety.
 - Inspection and testing requirements.
 - Required performance results.
 - Recording requirements.
 - Protection.
- C. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Architect.
- D. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of work and reconvene the conference at the earliest reasonable date.
- 1.05 PRE-ROOFING CONFERENCE:
- A. A pre-roofing conference is required before the roofing materials are installed. This conference shall be conducted by a representative of the Architect and attended by representatives of the Owner, Roofing Consultant, General Contractor, Roofing Contractor, Sheet Metal Contractor, Roof Deck Manufacturer (if applicable) and the Roofing Materials Manufacturer (if warranty is required of this manufacturer). If mechanical equipment of substantial size is to be placed on the roof, the Mechanical Contractor must also attend this meeting. **ATTENDANCE OF THE CONTRACTORS PROJECT FOREMAN IS MANDATORY!**
- B. The pre-roofing conference is intended to clarify demolition (for renovation or re-roofing projects) and application requirements for work to be completed before roofing operations can begin. This would include a detailed review of the specifications, roof plans, roof deck information, flashing details, and approved shop drawings, submittal data, and samples. If conflict exists between the specifications and the Manufacturer's requirements, this shall be resolved. If this pre-roofing conference cannot be satisfactorily concluded without further inspection and investigation by any means of the parties present, it shall be reconvened at the earliest possible time to avoid delay of the work. In no case should work proceed without inspection of all roof deck areas and substantial agreement on all points.
- C. The following items are to be accomplished during the conference:
1. Review all Factory Mutual and Underwriters Laboratories requirements listed in the

- specifications and resolve any questions or conflicts that may arise.
2. Establish trade-related job schedules, including the installation of roof-mounted mechanical equipment.
3. Establish roofing schedule and work methods that will prevent roof damage.
4. Require that all roof penetrations and walls be in place prior to installing the roof.
5. Establish those areas on the job site that will be designated work and storage areas for roofing operations.
6. Establish weather and working temperature conditions to which all parties must agree.
7. Establish acceptable methods of protecting the finished roof if any trades must travel across or work on or above any areas of the finished roof. The Architect shall prepare a written report indicating actions taken and decisions made at this pre-roofing conference. This report shall be made a part of the project record and copies furnished to the General Contractor, the owner, the roof consultant, the Building Commission, and the Building Commission Inspector.
8. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work performed by other trades.
9. Review structural loading limitations of deck and inspect deck for proper installation and fastening as required. Inspect deck for required slope etc
10. Review roofing system requirements (drawings, specifications and other contract documents).
11. Review required submittals and samples of required warranties/guarantees to be furnished.
12. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment and facilities, needed to commence the work and to avoid delays.
13. Review required inspection, testing, certifying and materials usage accounting procedure.
14. Review weather and forecast' weather conditions, and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not mandatory requirement).
15. Review roof application procedures, technique, details and roof specifics.
16. Review job specific safety requirements, safety barriers, street blocking, haul routes, building access, site contact, facilities, security, etc.
17. FM Listing: Provide roofing systems and component materials which have been evaluated by Factory Mutual System for fire spread, wind-uplift, and hail damage and are listed in "Factory Mutual Approval Guide" for Class I construction.
18. Provide roof covering materials bearing FM approval marking on bundle, package or container, indicating that material has been subjected to FM's examination and follow-up inspection service.

1.06 PROGRESS MEETINGS

- A. Conduct progress meetings at the Project Site. Notify the Owner and Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.
- B. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities should be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.
- C. Contractor=s Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor=s Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to

ensure that current and subsequent activities will be completed within the Contract Time.

- (1) Review the present and future needs of each entity present.

D. Reporting: No later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

- (1) Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

END OF SECTION 01200

SECTION 01300 - SUBMITTALSPART 1 - GENERAL1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Division 1 Specification Sections, apply to work of this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:

- Contractor's construction schedule.
- Daily construction reports.
- Shop Drawings.
- Product Data.
- Samples.

1.03 SUBMITTAL PROCEDURESA. ELECTRONIC SUBMITTAL PROCEDURES

- 1. Summary:
 - a. Shop drawing and product data submittals may be transmitted to Architect in electronic (PDF) format.
 - b. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
 - c. The electronic submittal process is not intended for color samples, color charts, or physical material samples.
- 2. Procedures:
 - a. Submittal preparation – Contractor may use any or all of the following options:
 - 1. Subcontractors and Suppliers may provide electronic (PDF) submittals to the Contractor via email.
 - 2. Subcontractors and Suppliers provide paper submittals to General Contractor who electronically scans and converts to PDF format.
 - b. Contractor shall review and apply electronic stamps certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.
 - c. Contractor may transmit each submittal to Architect in electronic format.
 - d. Architect / Engineer review comments will be made in electronic format and returned to the General Contractor with an electronic I.O.
 - e. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.
 - f. Submit paper copies of reviewed submittals at project closeout for record purposes in accordance with Section 07100 – Project Closeout.

3. Section 01300 - Administrative Requirements - Electronic Submittal Requirements as defined above are applicable to all technical sections of the specifications that require submittals.
- B. 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.
 - (1) Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
 - (2) Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. 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 re-submittals.

1.04 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Schedule: Prepare a fully developed, CPM-type Contractor's construction schedule. Submit within 30 days of the date established in the "Notice to Proceed" for commencement of the Work.
- B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner's Representative, Subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
 - (1) When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. 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.

1.05 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Architect and Owner's Representative at bi-weekly intervals:
 - List of subcontractors at the site.
 - Approximate count of personnel at the site.
 - High and low temperatures; General weather conditions.
 - Accidents and unusual events.
 - Meetings and significant decisions.
 - Stoppages, delays, shortages, losses.
 - Meter readings and similar recordings.

Emergency procedures.
Orders and requests of governing authorities.
Change Orders received, implemented.
Services connected, disconnected.
Equipment or system tests and start-ups.
Partial Completion, occupancies.
Substantial Completions authorized.

1.06 SHOP DRAWINGS

- A. 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 Shop Drawings.
- B. 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.
- C. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

1.07 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data included printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings".
- B. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities.
 - (1) Do not permit use of unmarked copies of Product Data in connection with construction.

1.08 SAMPLES

- A. Submit fully-fabricated samples (full-size where appropriate) 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.
- B. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.

- C. Maintain sets of samples, as returned, at the Project Site, for quality comparisons throughout the course of the construction.

1.09 ARCHITECT'S ACTION

- A. Action Stamp: The Architect will stamp each copy of each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, to indicate the action taken.
- B. Do not permit submittals marked "Revise and Resubmit" to be used at the Project Site, or elsewhere where Work is in progress.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01300

SECTION 01400 - QUALITY CONTROL SERVICES

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 for quality control services.
- B. Quality control services include inspections and tests and related actions including reports performed by independent agencies and governing authorities. They do not include Contract enforcement activities performed by the Architect.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
 - (1) Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities.
 - (2) Inspections, tests and related actions specified are not intended to limit the Contractor=s quality control procedures that facilitate compliance with Contract Document requirements.

1.03 RESPONSIBILITIES

- A. Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor=s responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.
 - (1) The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform all inspections and tests specified, with the following exception:
 - (a) The Contractor will employ and pay for the services of an independent testing/balance agency, to provide testing, balancing and adjusting of HVAC equipment, as specified in a Division 15 Section.
- B. 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, the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
 - (1) The agency will not perform any duties of the Contractor.
 - (2) The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.
- C. Retesting: The Contractor is responsible for the cost of 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.
- D. 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:

- (1) Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
- (2) Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
- (3) Providing facilities for storage and curing of test samples.
- (4) Providing the agency with a concrete design mix proposed for use for material mixes that require control by the testing agency.
- (5) Security and protection of samples and test equipment at the Project site.

1.04 SUBMITTALS

- A. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Owner, Architect, and Contractor.
- (1) Submit additional copies of each written report directly to the governing authority, when the authority so directs.
 - (2) Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:
 - Date of issue.
 - Project title and number.
 - Name, address and telephone number of testing agency.
 - Dates and locations of samples and tests or inspections.
 - Names of individuals making the inspection or test.
 - Designation of the Work and test method.
 - Identification of project and Specification Section.
 - Complete inspection or test data.
 - Test results and an interpretation of test results.
 - Ambient conditions at the time of sample-taking and testing.
 - Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
 - Name and signature of laboratory inspector.
 - Recommendations on retesting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

- A. 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.
- B. Protect construction exposed by or for quality control service activities, and protect repaired construction.
- C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01400

SECTION 014100 – STRUCTURAL TESTS AND SPECIAL INSPECTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements required for compliance with the International Building Code, Chapter 17, Structural Tests and Special Inspections.
- B. Structural testing and special inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve contractor of responsibility for compliance with other construction document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the construction document requirements.
 - 3. Requirements for contractor to provide quality-assurance and -control services required by architect, owner, or authorities having jurisdiction are not limited by provisions of this section.
- C. The owner will engage one or more qualified special inspectors and / or testing agencies to conduct structural tests and special inspections specified in this section and related sections and as maybe specified in other divisions of these specifications.
- D. Related Sections include but are not limited to the following:
 - 1. 02300 EARTHWORK
 - 2. 03300 CAST-IN-PLACE CONCRETE.
 - 3. 04810 UNIT MASONRY ASSEMBLIES.
 - 4. 05120 STRUCTURAL STEEL.
 - 5. 05310 STEEL DECK.
 - 6. 05400 COLD-FORMED METAL FRAMING.

1.3 DEFINITIONS

- A. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official.
- B. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental instructions, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.
- C. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by the contractor based on the Construction Documents.
- D. Structural Observation: Visual observation of the structural system by a representative of the registered design professional's office for general conformance to the approved construction documents. Structural observations are not considered part of the structural tests and special inspections and do not replace inspections and testing by the testing agency or special inspector.
- E. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the code enforcement official and registered design professional in responsible charge, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer or engineering intern or a qualified representative from the testing agency.
- F. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.
- G. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.
- H. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the code enforcement official and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E329-03 Standard Specification for Agencies in the Testing and / or Inspection of Materials Used in Construction.
 - a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the building official for consideration before proceeding with work.

2. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

1.5 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the registered design profession in responsible charge for a decision before proceeding.
- C. The special inspector's reports and testing agencies results shall have precedence over reports and test results provided by the contractor.
- D. Where a conflict exists between the construction documents and approved shop drawings / submittal data, the construction documents shall govern unless the shop drawings / submittal data are more restrictive. All conflicts shall be brought to the attention of the registered design professional in responsible charge.

1.6 SUBMITTALS BY SPECIAL INSPECTOR AND / OR TESTING AGENCY

- A. Special inspectors shall keep and distribute records of inspections. The special inspector shall furnish inspection reports to the building official, and to the registered design professional in responsible charge, contractor, architect, and owner. Reports shall indicate that work inspected was done in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and to the registered design professional in responsible charge prior to the completion of that phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon by the permit applicant and the building official prior to the start of work.
 1. Special inspection reports and test results shall include, but not be limited to, the following:
 - a. Date of inspection.
 - b. Description of inspections or tests performed including location (reference grid lines, floors, elevations, etc.).
 - c. Statement noting that the work, material, and / or product conforms or does not conform to the construction document requirements.

- 1) Name and signature of contractor's representative who was notified of work, material, and / or products that do not meet the construction document requirements.
 - d. Name and signature of special inspector and / or testing agency representative performing the work.
- B. Schedule of Non-Compliant Work: Each agent shall maintain a log of work that does not meet the requirements of the construction documents. Include reference to original inspection / test report and subsequent dates of re-inspection / retesting.
- C. Reports and tests shall be submitted within 1 week of inspection or test. Schedule of Non-Compliant Work shall be updated daily and submitted at monthly intervals.
- D. Final Report of Special Inspections. Submitted by each agent listed in the schedule of Structural Testing and Special Inspections.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITY

- A. The contractor shall coordinate the inspection and testing services with the progress of the work. The contractor shall provide sufficient notice to allow proper scheduling of all personnel. The contractor shall provide safe access for performing inspection and on site testing.
- B. The contractor shall submit schedules to the owner, registered design professionals and testing and inspecting agencies. Schedules will note milestones and durations of time for materials requiring structural tests and special inspections.
- C. Each contractor responsible for the construction of a seismic-force-resisting system, designated seismic system, or component listed in the quality assurance plan shall submit a written contractor's statement of responsibility to the building official and to the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
 - 1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
 - 2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
 - 3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
 - 4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

- D. Each contractor responsible for the construction of a main windforce-resisting system or a wind-resisting component listed in the quality assurance plan shall submit a written statement of responsibility to the building official and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
 - 1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
 - 2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
 - 3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
 - 4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- E. The contractor shall repair and / or replace work that does not meet the requirements of the construction documents.
 - 1. Contractor shall engage an engineer / architect to prepare repair and / or replacement procedures.
 - 2. Engineer / architect shall be registered in the state in which the project is located. Engineer shall be acceptable to the registered design professional in responsible charge, code enforcement official, and owner.
 - 3. Procedures shall be submitted for review and acceptance by the registered design professional in responsible charge, code enforcement official, and owner before proceeding with corrective action.
- F. The contractor shall be responsible for costs of:
 - 1. Re-testing and re-inspection of materials, work, and / or products that do not meet the requirements of the construction documents and shop drawings / submittal data.
 - 2. Review of proposed repair and / or replacement procedures by the registered design professional in responsible charge and the inspectors and testing agencies.
 - 3. Repair or replacement of work that does not meet the requirements of the construction documents.

3.2 STRUCTURAL OBSERVATIONS

- A. Structural observations may be made periodically as determined by the registered design professional in responsible charge.

3.3 TESTING AND INSPECTION

- A. Testing and inspection shall be in accordance with the attached Schedule of Special Inspections.
- B. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings.

PART 4 - SCHEDULES AND FORMS (ATTACHED)

4.1 STATEMENT OF SPECIAL INSPECTIONS.

4.2 SCHEDULE OF SPECIAL INSPECTIONS.

4.3 FINAL REPORT OF SPECIAL INSPECTIONS.

END OF SECTION 01410

STATEMENT OF SPECIAL INSPECTIONS

Project:

Project Address:

Permit Applicant:

Applicant Address:

Owner:

Owner Address:

Registered Design Professionals (RDP):

Architect:

Geotechnical Engineer: MBA Engineers

Structural Engineer: MBA Engineers

Mechanical Engineer:

Electrical Engineer:

This statement of special inspections is submitted as a condition for permit issuance in accordance with Chapter 17 of the International Building Code. It includes a *Schedule of Special Inspections* applicable to the above referenced project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections.

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the building official and to the registered design professional in responsible charge at a frequency agreed upon by the permit applicant and building official prior to the start of work. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and the registered design professional in responsible charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted by each agent at the completion of that phase of work.

Maximum frequency of interim report submittals shall not be less than _____.

The Special Inspection program does not relieve the contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.



Project Name _____ **Project Address** _____

During construction of the referenced project, it is intended that special inspection as outlined in Chapter 17 of the 2016_ International Building Code be provided for by the owner. The following areas of work will require special inspection:

MATERIAL / ACTIVITY	FREQUENCY OF INSPECTION	INSPECTOR
A. Inspection of Wood Fabrication Process per 1704.2.1 & 1704.6.1	-----	Testing Agent
B. Inspection of Steel Fabrication Process per 1704.2.1 (Not required if fabricator is registered and approved per Section 1704.2.2)	-----	Testing Agent
C. Inspection of Steel per 1704.3 – 1704.3.3.3 & Table 1704.3		
1. Material verification of high-strength bolts, nuts and washers:		
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	Periodic	Testing Agent
b. Manufacturer's certificate of compliance required.		Testing Agent
2. Inspection of high-strength bolting:		
a. Bearing-type connections.	Periodic	Testing Agent
b. Slip-critical connections.	Periodic	Testing Agent
3. Material verification of structural steel:		
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	-----	Testing Agent
b. Manufacturers' certified mill test reports.	-----	Testing Agent
4. Material verification of weld filler materials:		
a. Identification markings to conform to AWS specification in the approved construction documents.	-----	Testing Agent
b. Manufacturer's certificate of compliance required.	-----	Testing Agent
5. Inspection of welding:		
a. Structural Steel:		
1) Complete and partial penetration groove welds.	Continuous	Testing Agent
2) Multipass fillet welds.	Continuous	Testing Agent
3) Single-pass fillet welds > 5/16"	Continuous	Testing Agent
4) Single-pass fillet welds ≤ 5/16"	Periodic	Testing Agent
5) Floor and deck welds.	Periodic	Testing Agent
b. Reinforcing steel:		
1) Verification of weldability of reinforcing steel other than ASTM A 706.	Periodic	Testing Agent
2) Reinforcing steel-resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special reinforced concrete shear walls and shear reinforcement.	Continuous	Testing Agent
3) Shear reinforcement.	Continuous	Testing Agent
4) Other reinforcing steel.	Periodic	Testing Agent
6. Inspection of steel frame joint details for compliance with approved construction documents:		
a. Details such as bracing and stiffening.	Periodic	Engineer
b. Member locations.	Periodic	Engineer
c. Application of joint details at each connection.	Periodic	Engineer



MATERIAL / ACTIVITY	FREQUENCY OF INSPECTION	INSPECTOR
D. Inspection of Concrete per 1704.4 – 1704.4.1 & Table 1704.4		
1. Inspection of reinforcing steel, including prestressing tendons, and placement.	Periodic	Engineer
2. Inspection of reinforcing steel welding in accordance with Table 1704.3, Item 5B.	-----	Testing Agent
3. Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	Continuous	Testing Agent
4. Verifying use of required design mix.	Periodic	Testing Agent
5. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	Continuous	Testing Agent
6. Inspection of concrete and shotcrete placement for proper application techniques.	Continuous	Testing Agent
7. Inspection for maintenance of specified curing temperature and techniques.	Periodic	Testing Agent
8. Inspection of prestressed concrete:		
a. Application of prestressing forces	Continuous	Testing Agent
b. Grouting of bonded prestressing tendons in the seismic-force-resisting system.	Continuous	Testing Agent
9. Erection of precast concrete members.	Periodic	Testing Agent
10. Verification of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	Periodic	Testing Agent



MATERIAL / ACTIVITY	FREQUENCY OF INSPECTION	INSPECTOR
E. Inspection of Masonry per 1704.5 (Level 1)		
1. As masonry construction begins, the following shall be verified to ensure compliance:		
a. Proportions of site-prepared mortar.	Periodic	Testing Agent
b. Construction of mortar joints.	Periodic	Testing Agent
c. Location of reinforcement and connectors.	Periodic	Engineer
d. Prestressing technique.	Periodic	Testing Agent
e. Grade and size of prestressing tendons and anchorages.	Periodic	Engineer
2. The inspection program shall verify.		
a. Size and location of structural elements.	Periodic	Engineer
b. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.	Periodic	Engineer
c. Specified size, grade and type of reinforcement.	Periodic	Testing Agent
d. Welding of reinforcing bars.	Continuous	Testing Agent
e. Protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F).	Periodic	Testing Agent
f. Application and measurement of prestressing force.	Periodic	Testing Agent
3. Prior to grouting, the following shall be verified to ensure compliance.		
a. Grout space is clean.	Periodic	Testing Agent
b. Placement of reinforcement and connectors and prestressing tendons and anchorages.	Periodic	Engineer
c. Proportion of site-prepared grout and prestressing grout for bonded tendons.	Periodic	Testing Agent
d. Construction of mortar joints.	Periodic	Testing Agent
4. Grout placement shall be verified to ensure compliance with code and construction documents provisions.	Continuous	Testing Agent
5. Grouting of prestressing bonded tendons.	Continuous	Testing Agent
6. Preparations of any required grout specimens, mortar specimens and/or prisms shall be observed.	Continuous	Testing Agent
7. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.	Periodic	Testing Agent



MATERIAL / ACTIVITY	FREQUENCY OF INSPECTION	INSPECTOR
E. Inspection of Masonry per 1704.5 (Level 2)		
1. From the beginning of masonry construction, the following shall be verified to ensure compliance:		
a. Proportions of site-prepared mortar, grout and prestressing grout for bonded tendons.	Periodic	Testing Agent
b. Placement of masonry units and construction of mortar joints.	Periodic	Testing Agent
c. Placement of reinforcement, connectors and prestressing tendons and anchorages.	Periodic	Engineer
d. Grout space prior to grouting.	Continuous	Testing Agent
e. Placement of grout.	Continuous	Testing Agent
f. Placement of prestressing grout.	Continuous	Testing Agent
2. The inspection program shall verify:		
a. Size and location of structural elements.	Periodic	Engineer
b. Type, size and location of anchors, including other details of anchorage of masonry to structural members, framed or other construction.	Continuous	Engineer
c. Specified size, grade and type of reinforcement.	Periodic	Testing Agent
d. Welding of reinforcement.	Continuous	Testing Agent
e. Protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F).	Periodic	Testing Agent
f. Application and measurement of prestressing force.	Continuous	Testing Agent
3. Preparation of any required grout specimens, mortar specimens and/or prisms shall be observed.	Continuous	Testing Agent
4. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.	Periodic	Testing Agent
F. Inspection of Soil Conditions per 1704.7 – 1704.7.3	-----	Testing Agent
G. Inspection of Pile Foundations per 1704.8	Continuous	Testing Agent
H. Inspection of Pier Foundations per 1704.9	Continuous	Testing Agent
I. Inspection for Special Cases per 1704.13	-----	Testing Agent
J. Seismic Resistance Inspections & Testing per 1707 – 1707.8 & 1708 – 1708.5	-----	Testing Agent
K. Structural Observations per 1709.1 (Seismic Design Categories D, E or F)	-----	Engineer

FINAL REPORT OF SPECIAL INSPECTIONS

Project:

Project Address:

Testing / Inspection Agent:

Testing / Inspection Agent Address:

Scope of Testing / Inspections:

To the best of my information, knowledge, and belief, the special inspections or testing required for this project, and designated for this Agent in the *Schedule of Special Inspections* submitted for permit, have been completed in accordance with the contract documents.

Interim reports submitted prior to this final report and numbered to

-

 , form a basis for, and are to be considered an integral part of this final report.

Prepared By:

Type or print name

Signature

Date

Special Inspector's Seal

(Licensed Professional Engineer)

SECTION 1500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

- A. This Section specified requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.
- (1) Obtain and pay for all building permits, fees and licenses required by authorities having jurisdiction.
- B. Temporary utilities required include, but are not limited to:
- (1) Temporary electric power and light.
- (2) Telephone service (Cellular Service is acceptable).
- (3) Water service and distribution.
- C. Temporary construction and support facilities include, but are not limited to:
- (1) Temporary heat.
- (2) Field office and storage sheds.
- (3) Temporary roads and paving (Construction Entrances)
- (4) Sanitary facilities, including drinking water.
- (5) De-watering facilities and drains.
- (6) Temporary enclosures.
- (7) Hoists.
- (8) Temporary project identification signs and bulletin boards.
- (9) Waste disposal services.
- (10) Rodent and pest control.
- (11) Construction aids and miscellaneous services and facilities.
- (12) Project Identification Sign
- D. Security and protection facilities include, but are not limited to:
- (1) Temporary fire protection.
- (2) Barricades, warning signs, and lights.
- (3) Enclosure fence for the construction site.
- (4) Environmental protection.
- E. Related work specified elsewhere: Section 02301 "Erosion and Sedimentation Controls".

1.03 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
- (1) Building Code requirements
- (2) Health and safety regulations
- (3) Utility company regulations
- (4) Police, Fire Department and Rescue Squad rules

- (5) Environmental protection regulations
- B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series Standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities".
 - (1) Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.
 - (2) Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).
- C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.04 PROJECT CONDITIONS

- A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.
- B. Lumber and Plywood: Comply with requirements in Division-6 Section "Rough and Finish Carpentry".
 - (1) For safety barriers, sidewalk bridges and similar uses, provide minimum 5/8" thick exterior plywood.
- C. Tarpaulins: Provide waterproofing, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.
- D. Open-Mesh 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.

2.02 EQUIPMENT

- A. General: Provide new equipment; if acceptable to the Architect undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

- B. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
- D. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
- E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.
- F. 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.
- G. Temporary Office: Provide prefabricated or mobile unit with lockable entrances, operable windows and serviceable finishes. Provide heated and air conditioned units on foundations adequate for normal loading.
- H. 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 nonabsorbent material.
- I. First Aid Supplies: Comply with governing regulations.
- J. 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 exposure.
 - (1) Comply with NFPA 10 and 241 for classification, extinguishing, agent and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

- A. 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.
- (1) Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
 - (2) Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
 - (3) Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.
 - (4) Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect, and will not be accepted as a basis of claims for a Change Order.
- B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
- (1) Sterilize temporary water piping prior to use.
- C. Temporary Electric Power Service: Provide weatherproof, 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.
- (1) Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
- D. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.
- (1) Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.
- E. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period.
- (1) Post a list of important telephone numbers for persons having interest in this project, and for emergency services.
- F. Sewer and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.

3.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- A. Locate field offices, storage sheds, sanitary facilities and other temporary construction

and support facilities for easy access.

- (1) Maintain temporary construction and support facilities until near substantial completion. Remove prior to substantial completion. Personnel remaining after substantial completion will be permitted to use permanent facilities under conditions acceptable to the Owner.
- B. Provide incombustible construction for offices, shops and sheds, located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.
- C. Temporary Heat: Provide temporary heat required by construction activities for curing or drying of complete installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
- D. Heating Facilities: Except where use of the permanent system is authorized, provide vented self-contained LP gas or fueled oil heaters with individual space thermostatic control.
 - (1) Use of gasoline-burning space heaters, open flame, or salamander type heating units is prohibited.
- E. Field Office: Provide insulated, weathertight temporary office of sufficient size to accommodate required office personnel at the project site. Keep the offices clean and orderly for use for small progress meetings. Furnish and equip offices as appropriate to conduct business.
- F. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the project's needs.
 - (1) Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.
- G. Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.
 - (1) Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 - (2) Install tarpaulins securely, with combustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.
 - (3) Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.
- H. Collection and disposal of waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 degrees F (28 degrees C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful

manner.

- I. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division -2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations and construction free of water.
- J. Project Identification and Temporary Signs: Prepare project identification and other signs. Install signs where directed to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.
 - (1) Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as required by the Architect.
- B. Temporary Fire Protection: Comply with NFPA 10 "Standard for Portable Fire Extinguishers", and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".
 - (1) Locate fire extinguishers where convenient and effective for their intended purpose.
 - (2) Store combustible materials in containers in fire-safe locations.
 - (3) Maintain unobstructed access to fire extinguishers, and access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
 - (4) Provide supervision of welding operations, combustion type temporary heating units and similar sources of fire ignition.
- C. 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, including flashing red or amber lights.
- D. Enclosure Fence: When construction begins install an enclosure fence that will enclose a portion of the site sufficient to safely accommodate construction operations.
 - (1) Provide open-mesh, chain-link fencing with posts set in a compacted mixture of gravel and earth. Upon completion, remove fencing.
- E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrance to prevent unauthorized entrance, vandalism, theft and similar violations of security.
 - (1) 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.
- F. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or

polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.05 OPERATION, TERMINATION AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
 - (1) Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24 hour day basis where required to achieve indicated results and to avoid possibility of damage.
 - (2) Protection: Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Termination and Removal: Unless the Architect requests 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 not later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.
 - (1) Materials and facilities that constitute temporary facilities are property of the Contractor.

END OF SECTION 01500

SECTION 01700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 GENERAL

- A. Upon completion of the project, the Contractor shall be required to furnish the following items to the Architect before approval of final payment will be made:
- (1) **All other special warranties required by the various specification sections.**
 - (2) Roofing Contractor's Five (5) Year Roofing Guarantee.
 - (3) One (1) Year Warranties on all materials, equipment and workmanship provided by subcontractors who may be employed under this Contract.
 - (4) As Built Record Drawings (2 Sets).
 - (5) Complete maintenance instructions for all items requiring maintenance at the building.
 - (6) Evidence that all indebtedness has been paid to subcontractors and material suppliers.
 - (7) Affidavit of Advertisement of Completion.
 - (8) **THESE ITEMS SHALL BE FURNISHED (THREE (3) SETS) ALL AT ONE TIME AND IN A NEATLY BOUND FORM.**

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION (not applicable)

END OF SECTION 01700

SECTION 02100 – TERMITE CONTROL

PART 1 – GENERAL

1.01 GENERAL CONDITIONS

- A. The accompanying General Conditions, Part I, of these specifications shall apply to and form a part of this section.

1.02 SUMMARY

- A. Provide soil treatment for termite control, as herein specified.

1.03 QUALITY ASSURANCE

- A. Applicator: Company specializing in soil treatment for termite control, with five (5) years documented experience.
- B. Materials: Provide certification that toxicants conform to specified requirements.
- C. Material Packaging: Manufacturer's labels and seals identifying contents.

1.04 REGULATORY REQUIREMENTS

- A. Comply with State of Alabama requirements for application, licensing and authority to use toxicant chemicals.

1.05 WARRANTY

- A. **Provide a Five (5) Year Warranty Bonded Guaranty for material and installation.**
- B. Warranty Bonded Guaranty shall cover against invasion or propagation of subterranean termites, damage to building or building contents caused by termites; repairs to building or building contents so caused.
- C. Inspect work annually during warranty period and report findings in writing to Owner.
- D. The Owner reserves the right to renew the warranty bonded guaranty for an additional five years.

PART 2 - PRODUCTS

2.01 CHEMICALS

- A. The chemical used shall be one of the following, or approved equal, in the concentration designated on the labeled instructions:

Demon TC
Termidor

Aggreszor
Premise

PART 3 - EXECUTION

3.01 APPLICATION

- A. Apply toxicant immediately 12 hours prior to installation of vapor barrier at slabs on grade, or finish grading outside foundation walls, porches and steps.
- B. Apply toxicant in strict accordance with manufacturer's instructions, in rates of coverage as recommended by manufacturer.
- C. Apply extra treatment to structural penetrations, including but not limited to piping, conduit and other soil penetrations.
- D. Apply as a coarse spray to ensure uniform distribution.
- E. Coordinate soil treatment at foundation perimeter with finish grading and landscaping work, to avoid disturbance of treated soil. Retreat disturbed treated soil as necessary.

3.01 RETREATMENT

- A. If inspection identifies the presence of termites, retreat soil and retest.
- B. Use same toxicant as used for original treatment.

END OF SECTION 02100

SECTION 024100 – DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Building demolition including hazardous materials abatement. Specifications for such are included in the Appendix.
- B. Selective demolition of built site elements.
- C. Selective demolition of building elements for alteration purposes.
- D. Abandonment and removal of existing utilities and utility structures.

1.2 RELATED REQUIREMENTS

- A. Section 01 1000 – Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 1000 – Summary: Description of items to be salvaged or removed for re-use by Contractor.
- C. Section 01 5000 – Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- D. Section 01 6000 – Product Requirements: Handling and storage of items removed for salvage and relocation.
- E. Section 01 7000 – Execution and Closeout Requirements: Project conditions: protection of benchmarks, survey control points, and existing construction to remain: reinstallation of removed products: temporary bracing and shoring.
- F. Section 31 2200 – Grading: Topsoil removal.
- G. Section 31 2323 – Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.3 REFERENCE STANDARDS

- A. 29 CFR 1926 – U.S. Occupational Safety and Health Standards; current edition
- B. NFPA 241 – Standard for Safeguarding Construction, Alteration, and Demolition Operations: 2013.

1.4 SUBMITTALS

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Site Plan: Showing:
 - 1. Vegetation to be protected.
 - 2. Areas for temporary construction and field offices
 - 3. Areas for temporary and permanent placements of removed materials.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.

2. Identify demolition firm and submit qualifications.
 3. Include a summary of safety procedures.
- D. Project record documents: Accurately record actual locations of capped and active utilities and subsurface construction.
- E. Temporary Shoring Plans and Calculations. Contractor is required to provide a set of construction plans for the required temporary shoring, stamped and signed by an outside/third party Structural Engineer hired by the Contractor and licensed in the State of Alabama. Provide a geotechnical exploration and a stamped geotechnical engineer's report if the Contractor is to have any slope steeper than 2:1 (2 horizontal to 1 vertical). Stamped wall design calculations from the engineer are required to accompany the plans. MBA shall be given 2 weeks to review plans and calculations to determine if the plans provided generally meet the requirements and are of sound design.

1.5 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
1. Minimum of five years of documented experience. Refer to Prequalification and Owner requirements if provided elsewhere. .

PART 2 - PRODUCTS

2.1 MATERIALS

1. Fill Material: As specified in Section 31 2000 - EARTHWORK

PART 3 - EXECUTION

3.1 SCOPE

- A. Remove the entire buildings as designated on Drawings.
- B. Remove paving and curbs as required to accomplish new work.
- C. Remove all other paving and curbs as indicated on drawings.
- D. Remove concrete slabs on grade as indicated on drawings.
- E. Remove other items indicated, for salvage and recycling.
- F. Fill excavations, open pits, and holes in ground areas generated as a result of removals, using specified fill: compact fill as specified in Section 31 2200.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
1. Obtain required permits.
 2. Comply with applicable requirements of NFPA 241.
 3. Use of explosives is not permitted.

4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 5. Provide, erect, and maintain temporary barriers and security devices.
 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 8. Do not close or obstruct roadways or sidewalks without permit.
 9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.
- E. Protect existing structures and other elements that are not to be removed.
1. Provide bracing and shoring.
 2. Prevent movement or settlements of adjacent structures.
 3. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. Partial Removal of Paving and Curbs: Neatly saw-cut at right angle to surface

3.3 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone: identify and mark utilities to be subsequently reconnected, in same manner as the other utilities to remain.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as shown.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being constructed from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustrail partitions of construction specified in Section 01 5000 in locations indicated on drawings.
 - 2. Provide retardant partitions of construction indicated on drawings in locations indicated on drawings.
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
- D. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted work, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on drawings.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 - 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - 3. See Service 01 1000 for other limitations on outages and required notifications.
 - 4. Verify that abandoned services serve only abandoned facilities before removal.
 - 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

- F. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch as specified for patch work.

3.5 DEMOLITION FOR ALTERATIONS AND FULL BUILDING DEMOLITION

- A. Remove debris, junk, and trash from site.
- B. Remove from site all materials not to be reused on site; do not burn or bury.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 024100

SECTION 22 1313 - FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes gravity-flow, non-pressure sanitary sewerage outside the building from the main, to within 5' of the building, with the following components:
 - 1. Cleanouts.

1.2 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene-monomer rubber.
- C. FRP: Fiberglass-reinforced plastic.
- D. LLDPE: Linear low-density, polyethylene plastic.
- E. PE: Polyethylene plastic.
- F. PP: Polypropylene plastic.
- G. PVC: Polyvinyl chloride plastic.
- H. RTRF: Glass-fiber-reinforced, thermosetting-resin fitting.
- I. RTRP: Glass-fiber-reinforced, thermosetting-resin pipe.
- J. TPE: Thermoplastic elastomer.

1.3 PERFORMANCE REQUIREMENTS

- A. The work shall comply with Gadsden Water Works and Sewer Board (GWWSB) performance requirements.

1.4 SUBMITTALS

- A. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

1.5 Field quality-control test reports. DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

2.2 DUCTILE-IRON PIPE AND FITTINGS

- A. Pipe shall be centrifugally cast and manufactured and tested in accordance with ANSI/AWWA C151/A21.51. Minimum thickness classification shall be Class 350. Each pipe shall be hydrostatically tested before shipment to a minimum pressure of 500psi.
- B. All ductile iron pipe shall have a cement mortar lining of standard thickness conforming to ANSI/AWWA C104/A21.4 and a standard bituminous outer coating. Ductile iron fittings are not required to have a cement-mortar lining, but are required to have an epoxy lining.
- C. Joints shall be push-on type such as Fastite, Tyton, Super Bell-tite, or approved equal. Joints shall be manufactured in accordance with ANSI/AWWA C111/A21.11 / ASTM A 746.
- D. Ductile iron pipe shall be push-on type such as Fastite, Tyton, Super Bell-tite, or approved equal. Ductile iron push-on fittings shall be manufactured and tested in accordance with ANSI/AWWA C153/A21.53. Where fittings are noted to be mechanical joint, they shall meet AWWA C110. Ductile iron fittings shall be design for the same working pressure, laying conditions, and cover as the pipe which is used. Joints shall be standard push-on joints and shall conform to ANSI/AWWA C111/A21.11.
- E. The joining of push-on joint ductile iron pipe shall be performed in accordance with ANSI/AWWA C600 Installation of Ductile Iron Water Mains and their Appurtenances. Instructions for the assembly of push-on joints may vary according to the manufacturer. The procedure for joining pipe equipped with push-on joints must therefore be in accordance with instructions of the manufacturer of the particular joint furnished.
- F. For push-on ductile iron pipe, the inside of the bell and the outside of the spigot end shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter. The circular rubber gasket shall be flexed inward and inserted in the gasket recess of the socket. A thin coating of gasket lubricant shall be applied to either the inside surface of the gasket or outside surface of the spigot, or both. Gasket lubricant shall be supplied by the manufacturer.
- G. Compact Fittings: AWWA C153, for push-on joints.

2.3 PVC PIPE AND FITTINGS

- A. PVC Type PSM Sewer Piping:
 - 1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
 - 2. Fittings: ASTM D 3034, PVC with bell ends.

- 3. Gaskets: ASTM F 477, elastomeric seals.
- B. PVC (Polyvinyl Chloride) ASTM D 1785, Schedule 40.
 - 1. PVC Fittings: Elastomeric gasketed joint, unless otherwise acceptable to local public water utility company.
 - a. Solvent Cement: ASTM D 2564.
 - b. Gaskets: ASTM F 477, elastomeric seal.

2.4 CLEANOUTS

- A. Cast-Iron Cleanouts, round, gray-iron housing with clamping device and round, secured, scoriated, nickel bronze top cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
 - 1. Manufacturers and product(s):
 - a. Zurn ZN1400HD-3
 - b. Smith 4220
 - c. approved equal
 - 2. Lids must have "SEWER" or "C.O." stamped on the lid from the factory.
 - 3. Sewer Pipe Fitting and Riser to Cleanout: Cast Iron / Ductile iron pipe and fittings, as required by agency.
- C. Cleanouts greater than 6 inches in diameter shall be set below grade so that they can be covered with a heavy duty "Zurn" Access Box or approved alternative. Access Box must be heavy duty and top must be scoriated for slip resistance and clearly identified with "SEWER" or "C.O." stamped on the lid.

2.5 CONCRETE

- A. General: Cast-in-place concrete shall meet the requirements of GWWSB.
- B. General: according to ACI 318/318R, ACI 350R, and the following:
 - 1. Cement: ASTM C 150, Type I cement for thrust blocks and concrete encasement, Type II cement for manhole inverts or in locations where the concrete will come in contact with the wastewater.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable.
- C. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
 - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.
- D. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

- E. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
 - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.6 NON-SHRINKING GROUT CEMENT

- A. Non-shrinking grout cement shall be Bonsal Instant Hydraulic Cement or Thoro Waterplug. No other products shall be allowed.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall identify the locations of all underground utilities prior to beginning excavation. The Contractor shall consult with AL One-Call, and utility companies to verify locations of the existing utilities.
- B. The Contractor shall obtain a Sanitary Sewer Impact Permit from the GWWSB before commencing work if required.
- C. All material, construction methods and testing on the sanitary sewer system shall be in accordance with GWWSB standards.

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- C. Install cleanouts for changes in direction greater than 45 degrees and provide at 75' maximum spaces.
- D. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

- A. Basic piping joint construction is specified in Division 22 Section "Common Work Results for Plumbing." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

- B. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use heavy-duty, top-loading classification cleanouts. .
 - 2. Use extra-heavy-duty, top-loading classification cleanouts in roads, streets, and loading areas.
- C. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.
- D. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.
- E. Coordinate with Hardscape design and Architect for Cleanouts in sidewalk areas.

3.4 FIELD QUALITY CONTROL

- A. All testing is to comply with GWWSB. If not specified by GWWSB, the Contractor to comply with the following test requirements.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate report for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Submit separate report for each test.
 - 5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

- a. Allowable leakage is maximum of 50 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.
 - b. Close openings in system and fill with water.
 - c. Purge air and refill with water.
 - d. Disconnect water supply.
 - e. Test and inspect joints for leaks.
 - f. Option: Test ductile-iron piping according to AWWA C600, "Hydrostatic Testing" Section. Use test pressure of at least 10 psig.
6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
- a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
 - b. Option: Test concrete gravity sewer piping according to ASTM C 924.
- D. Leaks and loss in test pressure constitute defects that must be repaired.
- E. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 221313

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 MATERIAL OWNERSHIP

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

1.3 SUBMITTALS

- A. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions and said property and affected adjoining properties.

1.4 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises (Refer to Architect for Details).
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and any plant protection measures are in place.
- E. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving".
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control measures shown on the Drawings and the requirements of the Alabama Department of Environmental Management (ADEM).
- B. Construction Exit Pads (CEPs), perimeter sediment barriers, inlet protection, Sedimentation Basins (SBNs), and/or temporary sediment traps with a minimum volume of 67 Cubic Yards per acre of disturbed area shall be considered the minimum items required.

- C. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- D. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- E. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. General: Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities and as required to perform the work.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect and Engineer not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Engineer's written permission.
- C. Removal of underground utilities is included in earthwork sections and with applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security and utilities sections and Section 024116 "Structure Demolition" and Section 024119 "Selective Structure Demolition."
- D. Contractor shall coordinate all work within 25' of overhead and underground power lines with Alabama Power prior to performing any work. The Contractor shall also coordinate all crane and boom truck work Alabama Power. The Contractor shall comply with all Alabama Power and OSHA safety clearance regulations for power lines.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Grind down stumps and remove roots, obstructions, and debris to a depth of 36 inches below finished subgrade or depth of undercut, whichever is deeper.
 - 2. Use only hand methods for grubbing within protection zones.
- B. All existing structures (including above and below ground construction) within the project area shall be removed. Removal shall include any foundations, existing paving larger than 4" in any direction, building materials, underground pipes and lines, etc.
- C. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil from areas to be graded in a manner to prevent intermingling with underlying subsoil or other waste materials. A depth of approximately 5 inches was indicated by the geotechnical report.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Surround with silt fencing in order to prevent erosion from carrying sediment downstream. If necessary cover to prevent windblown dust. Provide temporary seeding and mulching for all stockpiles if stockpile is planned to remain for a period of 13 days or more. If necessary cover to prevent windblown dust.

3.7 SITE IMPROVEMENTS

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

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property, or waste at a suitable location on-site with Owner's written approval.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. No Geotechnical Report has been prepared for this project, however if geotechnical findings or reports become available, the Engineer will have the information for review. Confirm with the Engineer.

1.2 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Subbase course and base course for asphalt paving.
6. Excavating and backfilling for utility trenches.

1.3 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized

excavation, as well as remedial work directed by Architect, shall be without additional compensation.

- G. Fill: Soil materials used to raise existing grades.
 - H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
 - I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
 - J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
 - K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- 1.4 PROJECT CONDITIONS
- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.
 - B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.
 - C. Do not commence earth moving operations until plant-protection measures and erosion and sediment control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification [Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487] or a combination of these groups; free of rock or gravel larger than 4 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Also, the soils must meet the following criteria:
 - 1. Liquid Limit: less than 50
 - 2. Plasticity Index: less than 25
 - 3. Maximum Dry Density: Greater than 100 pcf

- C. Unsatisfactory Soils: Soil Classification [Groups GC, SC, ML, OL, CH, MH, OH, and PT according to ASTM D 2487] or a combination of these groups, as well as alluvial soils and organic soils.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve. ALDOT 825-B Crushed Aggregate Base unless shown differently on the Civil plans.
- F. Engineered Fill: A Borrow Soil of Soil Classification [Groups GM, GC, SM, SC, and CL according to ASTM D 2487] or a combination of these groups; free of rock or gravel larger than 4 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Also, the Engineered Fill soils must meet the following criteria:
 - 1. Liquid Limit: less than 50
 - 2. Plasticity Index: less than 25
 - 3. Maximum Dry Density: Greater than 105 pcf
- G. Structural Fill:
- H. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- I. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57 (ALDOT #57 Stone); with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection,

detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

1. Red: Electric
 2. Yellow: Gas, oil, steam, and dangerous materials
 3. Orange: Telephone and other communications
 4. Blue: Water systems
 5. Green: Sanitary sewer
- C. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
1. Grab Tensile Strength: 110 lbf); ASTM D 4632.
 2. Tear Strength: 40 lbf); ASTM D 4533.
 3. Puncture Resistance: 50 lbf); ASTM D 4833.
 4. Water Flow Rate: 150 gpm per sq. ft.); ASTM D 4491.
 5. Apparent Opening Size: No. 50); ASTM D 4751.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, EARTH

- A. Earth Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Earth excavation also includes undercut as shown in the plans and specifications. Earth Excavation does not include rock. The soil is noted as unclassified excavation.
 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials or rock, replace with engineered fill or satisfactory soil materials as specified in the construction documents / as required.

3.3 EXCAVATION, ROCK

- A. Rock Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. The Contractor will NOT be paid for rock excavation up to limits shown in plans and specifications. See Unit Price Section for rock excavation.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials or rock, replace with engineered fill or satisfactory soil materials as specified in the construction documents / as required.

3.4 SITE UNDERCUTTING - After clearing and grubbing, demo, and earthwork to get the site to subgrade, undercutting to remove low consistency soils and highly plastic clay soils is required.

- A. Undercutting of low consistency soils underneath improvements (structures, porches, patios, retaining walls, and slabs, etc.) is required to be monitored by the owner's geotechnical engineer. Removal of up to 8' depth of low consistency soil below existing grade is expected on the north side (half) of the building. Replacement with structural fill is required. See Unit Price Allowance for Payment Terms.
- B. Removal of all buried structures, foundations, utility lines, septic tanks, debris, etc. under the proposed improvements if encountered below subgrade level, is required. Replacement with structural fill is required. See Unit Price Allowance for Payment Terms.
- C. Undercutting of Highly Plastic Soils
 1. Under foundations for structures, patios, retaining walls, slabs on grade, etc., highly plastic soils (CH) shall be removed to a depth of at least 3' below subgrade and replaced with low plasticity clay soils (CL) that contain a minimum of 80% of material passing a US Standard No. 200 sieve. See Unit Price Allowance for Payment Terms.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
 1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course, or as required by the utility or regulatory agencies.
- D. Trenches in Tree- and Plant-Protection Zones:
 - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
 - 3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.8 SUBGRADE INSPECTION

- A. Proof-roll subgrade below the building slabs and pavements and as recommended by the geotechnical / materials testing firm, with a loaded pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with engineered fill; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section.
- D. Trenches under Roadways: Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 12 inches below the subgrade surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Division 3 Section
- E. Place and compact initial backfill as indicated on plans, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Place and compact final backfill of engineered fill or satisfactory soil (as required) to final subgrade elevation.
- G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

3.13 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12A PREPARATION OF SUBGRADE BELOW LEVEL OF UNDERCUT

- A. After undercutting operations for the structure and prior to placement of engineered fill, the top 12" of exposed subgrade shall be scarified and moisture conditioned wet of optimum (per the geotechnical engineer) and compacted.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages for Standard Proctor dry density according to ASTM D 698:
 1. Under structures, walls, and stairs, compact soils to a minimum of 98 percent of the Standard Proctor maximum dry density.
 2. Under walkways and sidewalks, and compact each layer of backfill or fill soil material at 95 percent Standard Proctor maximum dry density.
 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
 4. For utility trenches, compact each layer of initial and final backfill soil material at 98 percent with pneumatic-piston tampers.

3.15 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1 inch.
 - 3. Pavements: Plus or minus 1/2 inch.
 - C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.
- 3.16 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS
- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
 - B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 - 1. Shape subbase course and base course to required crown elevations and cross-slope grades.
 - 2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 3. Compact subbase course and base course within +/-2% optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of Standard Proctor maximum dry density according to ASTM D 698 or per the geotechnical engineer.
- 3.17 PREPARATION OF SOILS IN TURF GRASS AREAS
- A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Test soil to be used as topsoil. Amend according to test recommendations.
 - 2. Spread planting soil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Reduce elevation of planting soil to allow for soil thickness of sod. Retain first paragraph below if surface soils are amended in place and reused.
 - B. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
 - 1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
 - 2. Loosen surface soil to a depth of at least 6 inches. Apply soil amendments and fertilizers according to soil sample test recommendations and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.

- a. Apply fertilizer directly to surface soil before loosening.
- 3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.
- 4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade or pavements as follows:
 - 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 98 percent Modified Proctor maximum dry density according to ASTM D 1557.
 - 3. Refer to Construction Plans for under-slab drainage requirements and details.

3.19 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cold milling of existing hot-mix asphalt pavement.
 - 2. Hot-mix asphalt patching.
 - 3. Hot-mix asphalt paving.
 - 4. Hot-mix asphalt paving overlay.
 - 5. Pavement-marking paint.
 - 6. Asphalt Surface Treatments
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
 - 2. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.

1.2 DEFINITIONS

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.
- B. DOT: Department of Transportation.

1.3 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of state or local DOT.
 - 1. Standard Specification: Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction", 2008 edition.
 - 2. Measurement and payment provisions and safety program submittals included in the standard specifications do not apply to this Section.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Job-Mix Designs: For each job mix proposed for the Work.
- D. Samples: for each paving fabric, 12 by 12 inches, minimum.
- E. Qualification Data: For Manufacturer.
- F. Material Test Reports: For each paving material.

- G. Material Certificates: For each paving material, from manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.
- B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Alabama DOT for asphalt paving work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- C. Pre-installation Conference

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 - 1. Tack Coat: Minimum surface temperature of 60 deg F.
 - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials 55 deg F for water-based materials], and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- B. Fine Aggregate: [ASTM D 1073] [or] [AASHTO M 29], sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
- C. Mineral Filler: [ASTM D 242] [or] [AASHTO M 17], rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, [PG 64-22] [PG 58-28] [PG 70-22] <Insert performance grade>.
- B. Tack Coat: [ASTM D 977] [or] [AASHTO M 140] emulsified asphalt, or [ASTM D 2397] [or] [AASHTO M 208] cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Pavement-Marking Paint: MPI #32 Alkyd Traffic Marking Paint.
 - 1. Color: [White] [Yellow] [Blue] [As indicated].
- C. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.
 - 1. Color: [White] [Yellow] [Blue] [As indicated].
- D. Glass Beads: AASHTO M 247, Type 1.
- E. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
 - 1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.
- F. Wheel Stops: Solid, integrally colored, 96 percent recycled HDPE or commingled postconsumer and postindustrial recycled plastic; UV stabilized; [4 inches high by 6 inches wide by 72 inches long] <Insert dimensions>. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
 - 1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.
 - 2. Adhesive: As recommended by wheel-stop manufacturer for application to asphalt pavement.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction[; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types";] and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Base Course: ALDOT Section 825 Crushed Aggregate Base Course
 - 3. Binder Course: ALDOT Section 429 Binder Course
 - 4. Tack Coat: ALDOT Section 405 Tack Coat (0.05gal/SY, minimum)
 - 5. Wearing Course: ALDOT Section 429 Wearing Course
- B. All Asphalt and work in the ROW shall comply with ALDOT Standard and Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated, or as required to have a smooth transition at tie-in locations.
 - 1. Mill to a depth of 2 inches or as required to provide a depth of new pavement equal to the wearing surface or top layer of the asphalt surface.
 - 2. Mill to a uniform finished surface free of gouges, grooves, and ridges.
 - 3. Control rate of milling to prevent tearing of existing asphalt course.
 - 4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
 - 5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
 - 6. Transport milled hot-mix asphalt to asphalt recycling facility.
 - 7. Keep milled pavement surface free of loose material and dust.

3.3 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
 - 1. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.4 REPAIRS AND LEVELING

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.
 - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess

3.5 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
- C. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure for 72 hours minimum.
 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 2. Protect primed substrate from damage until ready to receive paving.
- D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.6 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 1. Spread mix at minimum temperature of 250 deg F.
 2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 1. Clean contact surfaces and apply tack coat to joints.
 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.

3. Offset transverse joints, in successive courses, a minimum of 24 inches .
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.8 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 ASPHALT CURBS (*No Asphalt Curbs Allowed for this project)

- A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust. Spread mix at minimum temperature of 250 deg F.
 1. Asphalt Mix: Same as pavement surface-course mix.
- B. Place hot-mix asphalt to curb cross section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.10 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 1. Base Course: Plus or minus 1/2 inch.

2. Surface Course: Plus 1/4 inch, no minus.

- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
1. Base Course: 1/4 inch
 2. Surface Course: 1/8 inch.
 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.11 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for [30] [90] days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
1. Broadcast glass beads uniformly into wet pavement markings at a rate of 6 lb/gal.

3.12 WHEEL STOPS

- A. Install wheel stops in bed of adhesive as recommended by manufacturer.
- B. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Replace and compact hot-mix asphalt where core tests were taken.
- C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.14 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Driveways.
 - 2. Roadways.
 - 3. Parking lots.
 - 4. Curbs and gutters.
 - 5. Walks.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Other Action Submittals:
 - 1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.3 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. ACI Publications: Comply with ACI 301 unless otherwise indicated.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than ____ percent.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.

- C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- E. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- F. Deformed-Steel Wire: ASTM A 496/A 496M.
- G. Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars zinc coated after fabrication according to ASTM A 767/A 767M, Class I coating]. Cut bars true to length with ends square and free of burrs.
- H. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

2.2 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I
 - a. Fly Ash: ASTM C 618, Class F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source.
 - 1. Maximum course aggregate size: 1" unless noted.
 - 2. Fine aggregate: Free of materials with deleterious reactivity when exposed to alkali in cement.
- C. Water: Potable and complying with ASTM C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
- F. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable,[free of carbon black,] non-fading, and resistant to lime and other alkalis.
 - 1. Color: As indicated by architect, if requested.

2.3 FIBER REINFORCEMENT

- A. Synthetic Fiber: [Monofilament] [or] [fibrillated] polypropylene fibers engineered and designed for use in concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 2 inches long (Fibers may be of graded lengths).

2.4 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, [Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry] [or] [cotton mats].
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

2.5 RELATED MATERIALS

- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

2.6 PAVEMENT MARKINGS

- A. Pavement Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M248, Type N; colors complying with FS TT-P-1952.
- B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II.
 - 1. Color: As indicated.
- C. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.
 - 1. Color: As indicated.

2.7 WHEEL STOPS

- A. Wheel Stops: Precast, air-entrained concrete.
 - 1. Dowels: Galvanized steel, 3/4 inch in diameter, 10-inch minimum length.

2. Adhesive: As recommended by wheel stop manufacturer for application to concrete pavement.

2.8 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, with the following properties by Class:
 1. Class A – 4000 psi compressive strength @ 28 Days. Maximum water to cement ratio shall be 0.40. Slump shall be a minimum of 2" and a maximum of 4". Air content shall be 6 percent plus or minus 1.5 percent.
 2. Class B – 3000 psi compressive strength @ 28 Days. Maximum water to cement ratio shall be 0.50. Slump shall be a minimum of 2" and a maximum of 4". Air content shall be 5 percent plus or minus 1.5 percent.
- B. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
- C. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd. .
- D. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions.

2.9 CONCRETE MIXING

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

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Proof-roll prepared subbase surface below concrete paving with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Replace and recompact as necessary to achieve a favorable proof roll test according to the testing / geotechnical representative.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

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

3.4 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness[,and at locations to match jointing of existing adjacent concrete paving]. Contraction joints in curbs, structures, etc. shall match up with joints in paving where possible.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

- A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.
- B. Comply with ACI 301 requirements for measuring, mixing, transporting, placing, and consolidating concrete.
- C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- D. Screed paving surface with a straightedge and strike off.
- E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.6 FLOAT FINISHING

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

- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
 - 3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
- C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions.
 - 1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
 - 2. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these.

3.8 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
 - 1. Elevation: 3/4 inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/2 inch.
 - 4. Joint Spacing: 3 inches.
 - 5. Contraction Joint Depth: Plus 1/4 inch, no minus.

6. Joint Width: Plus 1/8 inch, no minus.

3.9 PAVEMENT MARKING

- A. Allow concrete paving to cure for a minimum of 28 days and be dry before starting permanent pavement marking. Temporary marking may be necessary.
- B. Sweep and clean surface to eliminate loose material and dust.
- C. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.10 WHEEL STOPS

- A. Install wheel stops in bed of adhesive applied as recommended by manufacturer.
- B. Securely attach wheel stops to paving with not less than two steel dowels located at one-quarter to one-third points. Install dowels in drilled holes in the paving and bond dowels to wheel stop. Recess head of dowel beneath top of wheel stop.

3.11 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 329200 – TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Seeding.
 - 2. Erosion-control material(s).

1.2 DEFINITIONS

- A. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- B. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- C. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- D. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- E. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- F. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3 ACTION SUBMITTALS – N/A

1.4 INFORMATIONAL SUBMITTALS

- A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- B. Qualification Data: NA
- C. Product Certificates: NA.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

1.6 PROJECT CONDITIONS

- A. Planting Restrictions: Plant during one of the periods shown on plans. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: State-certified seed of grass species recommended by ALDOT
- C. Grass Seed Mix: Proprietary seed mix as follows:
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. ALDOT Seeding Charts

2.2 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
1. Do not use wet seed or seed that is moldy or otherwise damaged.
 2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate recommended by manufacturer.
- C. Protect seeded areas from hot, dry weather or drying winds by applying peat mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch (4.8 mm), and roll surface smooth.

3.6 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200

SECTION 331116 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
 - Section 312000 - "Earthwork"
 - Section 033000 - "Concrete"

1.2 SUMMARY

- A. This Section includes water service piping and appurtenances from the source of potable water to a point 5 feet outside the building.
- B. Products installed but not furnished under this Section include water meters provided by the utility company to the site, ready for installation. All fees and charges for water service, meters, taps, permits, etc., shall be paid by the Contractor.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data for valves, water meter, and identification devices.
 - 2. Shop drawings for precast concrete valve pits and meter pit, including frames and covers.
 - 3. Shop drawings for cast-in-place concrete valve pits and meter pit, including frames and covers.
 - 4. Coordination drawings showing pipe sizes, and valves and meter locations and elevations. Include details of underground structures, connections, anchors, and reaction backing. Show other piping in the same trench and clearances from water service piping. Indicate interface and spatial relationship between piping and proximate structures.
 - 5. Coordination profile drawings showing water service piping in elevation. Draw profiles at a horizontal scale of not less than 1 inch equals 50 feet and a vertical scale of not less than 1 inch equals 5 feet. Indicate pipe, valves, structures, meter, anchors, and reaction backing. Show types, sizes, materials, and elevations of other utilities crossing water service piping.
 - 6. Record drawings at project closeout of installed water service piping and products in accordance with requirements of Division 1.
 - 7. Maintenance data for valves and water meter, for inclusion in Operating and Maintenance Manuals specified in Division 1 Section "Project Closeout."

1.4 QUALITY ASSURANCE:

- A. Comply with requirements of utility supplying water to the project.
- B. Comply with requirements of the City of Gadsden and other authorities having jurisdiction, when more stringent than specified or otherwise indicated.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Preparation for Transport: Prepare valves for shipping as follows:
 - 1. Ensure valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends, flange faces, and weld ends.
 - 3. Set valves in best position for handling. Set gate valves closed to prevent rattling.
- B. Storage: Use the following precautions for valves during storage:
 - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect valves from weather. Store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valves off the ground or pavement in watertight enclosures.
- C. Handling: Use a sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

1.5 PROJECT CONDITIONS:

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that water service piping may be installed in compliance with the original design and referenced standards.

1.6 SEQUENCING AND SCHEDULING:

- A. Coordinate connection to public water main with utility company.
- B. Coordinate with interior water distribution piping.
- C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, subject to acceptance by and regulations of the local public water utility company:
 - 1. Gate Valves:
 - .. American Darling Valve; Div. of American Cast Iron Pipe Co.
 - .. Clow Valve Co.; Div. of McWane, Inc.

- .. Hammond Valve Corp.
- .. Jenkins Bros.
- .. Kennedy Valve; Div. of McWane, Inc.
- .. Milwaukee Valve Co.
- .. Mueller-Hersey; A Grinnell Co.
- .. Nibco, Inc.
- .. Stockham Valve & Fittings, Inc.
- .. U.S. Pipe & Foundry Co.
- .. Waterous Co.
- 2. Bronze Corporation Stops and Valves:
 - .. Ford Meter Box Co., Inc.
 - .. Hays Div.; Romac Industries.
 - .. McDonald, A.Y., Mfg. Co.
 - .. Mueller-Hersey; A Grinnell Co.
- 3. Drilling Machine Corporation Stops:
 - .. Ford Meter Box Co., Inc.
 - .. Hays Div.; Romac Industries.
 - .. Mueller-Hersey; A Grinnell Co.
- 4. Tapping Valves:
 - .. Clow Valve Co.; Div. of McWane, Inc.
 - .. Kennedy Valve; Div. of McWane, Inc.
 - .. Mueller-Hersey; A Grinnell Co.
 - .. U.S. Pipe & Foundry Co.
- 5. Water Meters:
 - .. Badger Meter, Inc.
 - .. Hays Div.; Romac Industries.
 - .. Kent Meters, Inc.
 - .. Mueller-Hersey; A Grinnell Co.
 - .. Rockwell Intl.; Measurement & Flow Control Div.
 - .. Schlumberger Industries; Neptune Water Div.
- 6. Drains:
 - .. Ancon, Inc.
 - .. Josam Co.
 - .. Smith (Jay R.) Mfg. Co.
 - .. Wade Div.; Tyler Pipe.
 - .. Zurn Industries, Inc.; Hydromechanics Div.
- 7. Underground Warning Tapes:
 - .. Allen Systems, Inc.; Reef Industries, Inc.
 - .. Brady (W.H.) Co.; Signmark Div.
 - .. Calpico, Inc.
 - .. Carlton Industries, Inc.
 - .. EMED Co., Inc.
 - .. Seton Name Plate Co.

2.2 PIPE AND PIPE FITTINGS, GENERAL:

- A. Pipe and pipe fitting materials shall be compatible with each other. Where more than one type of material or product is indicated, selection is Installer's option.
- B. Ductile-Iron Pipe: AWWA C151, Class 350.
 - 1. Lining: AWWA C104, cement mortar, sealcoated.
 - 2. Gaskets: AWWA C111.

3. Ductile-Iron and Cast-Iron Fittings: AWWA C110, ductile-iron or cast-iron, 250-psi pressure rating; or AWWA C153, ductile-iron compact fittings, 350-psi pressure rating.
 - a. Lining: AWWA C104, cement mortar.
 - b. Gaskets: AWWA C111, rubber.
 - c. Encasement: AWWA C105, polyethylene film tube.
- C. PVC (Polyvinyl Chloride) Pipe 4 Inches and Larger: AWWA C900; Class 150; with bell end and elastomeric gasket, with plain end for cast-iron or ductile-iron fittings, or with plain end for PVC elastomeric gasket fittings.
 1. Gaskets: ASTM F 477, elastomeric seal.
 2. PVC Couplings and Fittings: AWWA C900, with ASTM F 477 elastomeric seal gaskets.
 3. Ductile-Iron and Cast-Iron Fittings: AWWA C110, ductile-iron or cast-iron, 250-psi pressure rating; or AWWA C153, ductile-iron compact fittings, 350-psi pressure rating; of dimension to match pipe outside diameter.
 - a. Lining: AWWA C104, cement mortar.
 - b. Gaskets: AWWA C111, rubber.
- D. PVC (Polyvinyl Chloride) Pipe 6 Inches and Smaller: ASTM D 1785, Schedule 40.
 1. PVC Fittings: Elastomeric gasketed joint, unless otherwise acceptable to local public water utility company.
 - a. Solvent Cement: ASTM D 2564.
 - b. Gaskets: ASTM F 477, elastomeric seal.

2.3 VALVES:

- A. Nonrising Stem Gate Valves 3 Inches and Larger: AWWA C500, cast-iron double disc, bronze disc and seat rings, or AWWA C509, resilient seated; bronze stem, cast-iron or ductile-iron body and bonnet, stem nut, 200-psi working pressure, mechanical joint ends.
- B. Nonrising Stem Gate Valves, 2 Inches and Smaller: MSS SP-80; body and screw bonnet of ASTM B 62 cast bronze; with Class 125 threaded ends, solid wedge, nonrising copper-silicon alloy stem, brass packing gland, Teflon-impregnated packing, and malleable iron handwheel.
- C. Valve Boxes: Cast-iron box having top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.
 1. Provide a steel tee-handle operating wrench with each valve box. Wrench shall have tee handle with one pointed end, stem of length to operate valve, and socket fitting valve operating nut.
- D. Curb Stops: Bronze body, ground key plug or ball, and wide tee head, with inlet and outlet to match service piping material.
- E. Service Boxes for Curb Stops: Cast-iron box having telescoping top section of length required for depth of bury of valve and cover having lettering "WATER,"

and bottom section with base of size to fit over curb stop and barrel approximately 3 inches in diameter.

1. Provide steel tee-handle shut-off rod with each service box. Shut-off rod shall have tee handle with one pointed end, stem of length to operate curb stop, and slotted end fitting curb stop head.
- F. New Connections Larger than 2-Inches:
1. Tapping Sleeve and Tapping Valve: Provide a complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. The sleeve and the valve shall be compatible with the tapping machine to be used.
 - a. Tapping Sleeve: Cast-iron or ductile-iron 2-piece bolted sleeve with flanged outlet for new branch connection. Sleeve may have mechanical joint ends with rubber gaskets or have sealing rings in the sleeve body. Sleeve shall mate with the size and type pipe material being tapped. Outlet flange shall be size required for branch connection.
- G. New Connections 2-Inches and Smaller:
1. Service Clamps and Corporation Stops: Provide a complete assembly, including service clamp, corporation stop, and bolts and nuts. The clamp and stop shall be compatible with the drilling machine to be used.
 - a. Service Clamp: Cast iron or ductile iron with gasket and AWWA C800 threaded outlet for corporation stop, and threaded end straps.
 - b. Corporation Stops: Bronze body and ground key plug, with AWWA C800 threaded inlet and outlet to match service piping material.

2.4 ANCHORAGES:

- A. Clamps, Straps, and Washers: ASTM A 506, steel.
- B. Rods: ASTM A 575, steel.
- C. Rod Couplings: ASTM A 197, malleable iron.
- D. Bolts: ASTM A 307, steel.
- E. Cast-Iron Washers: ASTM A 126, gray iron.
- F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psi.
 1. Cement: ASTM C 150, Type I.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
 5. Refer to Section 03310 - "Concrete" for additional information and requirements.

2.5 VALVE PITS AND METER PIT- (if any):

- A. Concrete: Portland cement mix, 3000 psi.
 - 1. Cement: ASTM C 150, Type I.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable.
 - 5. Refer to Section 03310 - "Concrete" for additional information and requirements.
- B. Reinforcement: Steel conforming to the following:
 - 1. Fabric: ASTM A 185, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615, Grade 60, deformed.
 - 3. Refer to Section 03310 - "Concrete" for additional information and requirements.
- C. Ladder - (if required): ASTM A 36, steel, or may be polyethylene-encased cast-iron or steel steps.
 - 1. Provide for pits with bottoms 3'-0" or more below grade.

2.6 WATER METER:

- A. Water meter will be furnished by the utility company.
 - 1. Cost of meter and any installation charges shall be paid by the Contractor.
- B. Meter Box: Cast-iron body, cast-iron cover having lettering "WATER METER," and base section, of length to fit over service piping. The base section shall be open at the bottom, slotted, and may be cast iron, PVC, or a piece of clay or other pipe.

2.7 IDENTIFICATION:

- A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."
- B. Nonmetallic Piping Label: Engraved plastic laminate label, for installation on the main electrical meter panel; not less than 1 inch by 3 inches, with caption "CAUTION - THIS STRUCTURE HAS A NONMETALLIC WATER SERVICE."

PART 3 - EXECUTION

- 3.0 All work to the water system shall be in compliance with the Gadsden Water Works and Sewer Board (GWWSB) standards and regulations.

3.1 PREPARATION OF BURIED PIPE FOUNDATION:

- A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation throughout the length of the piping.

- B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated level.
- C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.
- D. Refer to Section 02200 - "Earthwork" for additional requirements.

3.2 INSTALLATION OF PIPE AND PIPE FITTINGS:

- A. Ductile-Iron Pipe: Install with cement-mortar-lined, ductile-iron or cast-iron, mechanical joint or push-on joint fittings and rubber gaskets in accordance with AWWA C600.
 - 1. Polyethylene Encasement: Install in accordance with AWWA C105.
- B. PVC (Polyvinyl Chloride) Pipe (4-inches and larger): Install with cement-mortar-lined, ductile-iron or cast-iron, mechanical joint or push-on joint fittings and rubber gaskets in accordance with AWWA M23.
- C. PVC (Polyvinyl Chloride) Pipe (3-inches and smaller): Install with PVC, Schedule 40 socket-type, solvent cement or elastomeric gasketed fittings in accordance with manufacturer's installation instructions.
- D. Depth of Cover: Provide minimum cover over piping of 12 inches below average local frost depth or 36 inches below finished grade, whichever is greater.
- E. Water Main Connection By Utility Company: Arrange and pay for tap in water main, of size and in location as indicated, from water utility.
- F. Water Main Connection By Contractor (if allowed and so opted): Tap water main with size and in location as indicated, in accordance with requirements of water utility.
 - 1. Install tapping sleeve and tapping valve in accordance with manufacturer's installation instructions
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 - 3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
 - 4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water service piping.
 - 5. Where indicated or required install curb stop in service piping with head pointing up and with cast-iron service box.
- G. Water Service Termination: Terminate water service piping 5'-0" from building foundation in location and invert as indicated. Provide temporary pipe plug for piping extension into building.

- H. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both, as indicated or required.

3.3 INSTALLATION OF VALVES:

- A. General Application: Use mechanical joint end valves for 3-inch and larger buried installation. Use threaded and flanged end valves for installation in pits and inside building. Use bronze corporation stops and valves, with ends compatible to piping, for 2-inch and smaller installation.
- B. AWWA-Type Gate Valves: Comply with AWWA C600. Install buried valves with stem pointing up and with cast-iron valve box.
- C. Bronze Corporation Stops and Curb Stops: Comply with manufacturer's installation instructions. Install buried curb stops with head pointed up and with cast-iron curb box.

3.4 INSTALLATION OF ANCHORAGES:

- A. Anchorages: Provide anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches.

3.5 APPLICATION OF PROTECTIVE COATINGS:

- A. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.6 INSTALLATION OF VALVE PITS AND WATER METER PIT:

- A. Construct of poured-in-place or precast concrete of dimensions indicated, or if not indicated, as required by project conditions and acceptable to utility company, with manhole frame and cover, ladder, and drain. Provide sleeves with waterproof sleeve seals for pipe entry and exit.
- B. Water Meter: Install water meter in accordance with AWWA M6, in meter pit, in location and with support as indicated. Provide 3-valve bypass around meter, full size of water service piping.

1. Comply with requirements of utility company and authorities having jurisdiction.

3.7 INSTALLATION OF IDENTIFICATION:

- A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.
- B. Attach nonmetallic piping label permanently to main electrical meter panel.

3.8 FIELD QUALITY CONTROL:

- A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have sufficiently hardened. Fill pipeline 24 hours prior to testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours, or as otherwise required by utility company, Code, and authorities having jurisdiction.
 - 1. Increase pressure in 50-psi increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psi. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits.

3.9 CLEANING:

- A. Clean and disinfect water distribution piping as follows, or as required by utility company, Code, and authorities having jurisdiction:
 - 1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired, prior to use.
 - 2. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, use the procedure described in AWWA C651, or as described below:
 - a. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.
 - b. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.
 - c. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.
 - d. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.
- B. Prepare reports for all purging and disinfecting activities.

3.10 VALVE SCHEDULE:

- A. Nonrising Stem Gate Valves - 4 Inches and Larger:

	AWWA - MECH JT	
<u>MANUFACTURER</u>	<u>C500</u>	<u>C509</u>
American Darling	55	85
Clow Valve	F-5065	F-6100

Kennedy Valve	571X	1571X
Mueller-Hersey	A-2380-20	A-2370-20
Stockham Valve	G-743-O	G-701-O
U.S. Pipe	3460	5460
Waterous	300 Series	500 Series

B. Nonrising Stem Gate Valves - 2 Inches and Smaller:

<u>MANUFACTURER</u>	<u>MSS SP-80 THREADED</u>
Hammond Valve Corp.	IB645
Jenkins Bros.	370
Milwaukee Valve Co.	1105M
Nibco	T-113 w/iron HW
Stockham Valve	B-103

C. Tapping Valves:

<u>MANUFACTURER</u>	
American Darling	565 or 865
Clow Valve	F-5093
Kennedy Valve	950X
Mueller-Hersey	H-667
U.S. Pipe	3860

D. Corporation Stops and Curb Stops:

<u>MANUFACTURER</u>	<u>CORP. STOPS</u>	<u>CURB STOPS</u>
Ford Meter Box	F Series	B Series
Hays	5000 Series	4000 Series
McDonald, A.Y.	3100, 4700 Series	6100 Series
Mueller-Hersey	H Series	H Series

END OF SECTION 331116

SECTION 33 4100 - STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Pipe and fittings.
 - 2. Non-pressure couplings
 - 3. Cleanouts.
 - 4. Manholes
 - 5. Concrete
 - 6. Stormwater inlets.
 - 7. Pipe outlets.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Manholes: Include plans, elevations, sections, details, frames, and covers.
 - 2. Catch basins and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.

1.03 INFORMATIONAL SUBMITTALS

- A. Quality-control reports.

1.04 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify [Architect] [Construction Manager] [Owner] no fewer than [two] <Insert number> days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without [Architect's] [Construction Manager's] [Owner's] written permission.

PART 2 PRODUCTS

*All Storm Pipe for this project shall be Schedule 40 PVC or A-2000 PVC as shown in plans unless approved by Engineer in writing.

2.01 PE PIPE AND FITTINGS

- A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.
 - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
 - 2. Silttight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.
- B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60 (DN 300 to DN 1500): AASHTO M 294M, Type S, with smooth waterway for coupling joints.
 - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
 - 2. Silttight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

2.02 PVC PIPE AND FITTINGS

- A. PVC Corrugated Sewer Piping (A-2000 or equal):

1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
 2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
 3. Gaskets: ASTM F 477, elastomeric seals
- B. PVC Smooth Sewer Piping:
1. Pipe SCHEDULE 40 PIPE AND FITTINGS
 2. PVC Fittings: Elastomeric gasketed joint, unless otherwise acceptable to local public water utility company.
 - a. Solvent Cement: ASTM D 2564.
 - b. Gaskets: ASTM F 477, elastomeric seal.

2.03 REINFORCED CONCRETE PIPE AND FITTINGS

- A. Reinforced-Concrete sewer Pipes (RCP), Culverts, and Fittings shall be in accordance with ASTM C 76. Reinforced concrete pipe shall be B or C Wall, Class III, or as shown on plans. Joints shall be tongue (spigot) and groove (bell) which are sealed with mortar or preformed flexible sealant per ASTM C990 and AASHTO M198, or other approved suitable sealant. Except for special pieces, pipe shall not be less than 8 feet in length. Elliptical reinforcing is not allowed. Pipe shall be in accordance with ASTM C 1479 and ASCE 15. Optional Seal for bell and spigot shall be rubber gasket in accordance with ASTM C443.

2.04 NONPRESSURE TRANSITION COUPLINGS

- A. Reinforced Concrete: Min. Size 10" each side of joint, 8" thick surrounding pipe both pipes to be joined. Interior of Pipe to be checked to be clear of any encumbrances.
- B. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- C. Sleeve Materials:
1. For Concrete Pipes: ASTM C 443 (ASTM C 443M), rubber.
 2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 3. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 4. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- D. Unshielded, Flexible Couplings:
1. Description: Elastomeric sleeve with[stainless-steel shear ring and] corrosion-resistant-metal tension band and tightening mechanism on each end.
- E. Shielded, Flexible Couplings:
1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- F. Ring-Type, Flexible Couplings:
1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.05 CLEANOUTS

- A. Cast-Iron Cleanouts:
1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

2. Top-Loading Classification(s): Heavy Duty in paved areas, Light Duty in Landscaped Areas, Medium Duty in Sidewalks.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Plastic Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.06 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
9. Steps: [Individual FRP steps or FRP ladder] [Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP] [ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches .
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange and 26-inch diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: [ASTM A 536, Grade 60-40-18 ductile] [ASTM A 48/A 48M, Class 35 gray] iron unless otherwise indicated.

2.07 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R (ACI 350M/350RM), and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.

3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
 1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.
- C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
 1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - a. Invert Slope: 0.50 percent, Minimum through manhole.
 2. Benches: Concrete, sloped to drain into channel.
 - a. Slope: 4-8 percent.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
 1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.08 STORMWATER INLETS

- A. Area Inlets:
 1. Open Throat Inlets: Standard precast or cast in place box (concrete 4000psi), with concrete lid on concrete piers creating an opening at least 36" in length and exactly 6" high on all four sides (unless noted on plans). Concrete Lid to be precast 6" thick with an HS-20 load rating. Ring and cover required for access and maintenance (24" min. diameter opening).
 2. Large Grate Inlets (larger than 16" in any direction): Standard precast or cast in place box (concrete 4000psi), with concrete top on which the frame and grate is embedded. Concrete Top to be precast 6" thick with an HS-20 load rating. Frame and Grate must have at least a 200 square inch open area and must have a HS-20 load rating. Frame and grate must be as shown on the plans (24" by 24" minimum) and must be approved via submittal(s).
 3. Landscape Grate Inlets - 12" x 12" Square grate inlets (unless otherwise directed):
 - a. ADS Nyoplast Drain Basin System, ADS Nyoplast In-line Inlets, or Approved Equal
 - 1) Standard H-20 Load Rated Rectangular Grate
 - 2) ADA compliant grate not required
 - 3) Ductile Iron Grate
 4. Hardscape and Sidewalk Grate Inlets - 8"x8" square grate inlets:
 - a. ADS Nyoplast Drain Basin System, ADS Nyoplast In-line Inlets, or Approved Equal
 - 1) Standard H-10 Load Rated Rectangular Grate unless in traffic condition, then H-20 load rating required
 - 2) ADA compliant grate
 - 3) Ductile Iron Grate
 - 4) Also approved inlet grate "Iron Age Design Regular Joe Heel Proof Catch Basin Grate"

- B. Wing Inlets: ALDOT "Type A" Reinforced Concrete Storm Sewer Inlet, Type 3 and Type 4: Refer to ALDOT Special Drawing Number I-621-S
- C. Frames and Grates: Heavy duty in Traffic Areas, according to utility standards.

2.09 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides or concrete slope paved headwalls, according to the plans.
- B. Flared End Sections: Conforming to Reinforced Concrete Pipe Specs
- C. Riprap Basins: Class 2 Riprap, 2' Thick over Filter Fabric

PART 3 EXECUTION

3.01 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.02 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow.
 - 2. Install piping [NPS 6 (DN 150)] <Insert value> and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
 - 3. Install piping with [36-inch (915-mm)] [48-inch (1220-mm)] [60-inch (1520-mm)] [72-inch (1830-mm)] <Insert dimension> minimum cover.
 - 4. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 - 5. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 - 6. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
 - 7. Install PE corrugated sewer piping according to ASTM D 2321.
 - 8. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 9. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

10. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
- G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
 1. Hub-and-spigot, cast-iron soil pipe and fittings.
 2. Hubless cast-iron soil pipe and fittings.
 3. Ductile-iron pipe and fittings.
 4. Expansion joints.

3.03 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
 1. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
 2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
 3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
 4. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
 5. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
 6. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
 7. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.
 8. Join nonreinforced-concrete sewer piping according to ASTM C 14 (ASTM C 14M) and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
 9. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
 10. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.04 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 1. Use Light-Duty, top-loading classification cleanouts in areas unless noted.
 2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic, sidewalk areas unless noted.
 3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic / service areas.
 4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads and public streets unless controlling municipality dictates otherwise.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18" by 18" by 8" thick. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.05 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.

- C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements.

3.06 CATCH BASIN INSTALLATION

- A. Set frames and grates to elevations indicated.
- B. All Sumps created or inherent in the manufacturer's design of the catch basin, inlet, or junction box shall be filled in with 3000psi concrete to the make a smooth flow line (invert) across the structure. This concrete invert shall extend up at least 1/4 pipe diameter above flow line and be shaped to the same diameter of the connecting pipes (with curves as necessary) to make a smooth transition across the structure.

3.07 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.
- F. All Sumps created or inherent in the manufacturer's design of the inlet or junction box shall be filled in with 3000psi concrete to the make a smooth flow line (invert) across the structure. This concrete invert shall extend up at least 1/4 pipe diameter above flow line and be shaped to the same diameter of the connecting pipes (with curves as necessary) to make a smooth transition across the structure.

3.08 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.

3.09 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."
- B. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
 - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.

- b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
- 4. Connection of French Drains to Existing Manholes shall be made with core drilling holes into the existing structures if at all possible. Over cutting shall allow the ½" to 1" gap by approved non-shrink grout or mortar.
- 5. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- C. Connect to sediment interceptors specified in Section 221323 "Sanitary Waste Interceptors" if applicable.
- D. Pipe couplings and expansion joints with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
 - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
 - a. [Unshielded] [Shielded] flexible couplings for same or minor difference OD pipes.
 - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.10 IDENTIFICATION

- A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 - 1. Use warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.11 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to requirements of authorities having jurisdiction.

3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 4. Submit separate report for each test.
 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
 - b. Option: Test plastic piping according to ASTM F 1417.
 - c. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 334100

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

- A. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- B. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- C. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer manufacturer testing agency.

- B. Welding certificates.
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- E. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.8 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:
 - 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301 (ACI 301M).
 - 2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.

- c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- 3. Overlaid Finnish birch plywood.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Regional Materials: Concrete shall be manufactured within 500 miles (800 km) of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- C. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I/II gray.
 - 2. Fly Ash: ASTM C 618, Class F.
- D. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- E. Air-Entraining Admixture: ASTM C 260/C 260M.
- F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

- 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- G. Water: ASTM C 94/C 94M and potable.

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A, except with maximum water-vapor permeance of. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- 1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
 - b. Insulation Solutions, Inc.; Viper VaporCheck 16.
 - c. Meadows, W. R., Inc.; Perminator 15 mil.
 - d. Raven Industries Inc.; Vapor Block 15 10.
 - e. Reef Industries, Inc.; Griffolyn Type-105 Type-65G 15 mil Green.
 - f. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- 1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; Confilm.
 - b. ChemMasters; SprayFilm.
 - c. Conspec by Dayton Superior; Aquafilm.
 - d. Dayton Superior Corporation; Sure Film (J-74).
 - e. Edoco by Dayton Superior; BurkeFilm.
 - f. Euclid Chemical Company (The), an RPM company; Eucobar.
 - g. Meadows, W. R., Inc.; EVAPRE.
 - h. Metalcrete Industries; Waterhold.
 - i. Nox-Crete Products Group; MONOFILM.
 - j. Sika Corporation; SikaFilm.
 - k. SpecChem, LLC; Spec Film.
 - l. Symons by Dayton Superior; Finishing Aid.
 - m. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
 - n. Unitex; PRO-FILM.
 - o. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
 - 1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following
 - a. BASF Construction Chemicals - Building Systems; Kure 200.
 - b. ChemMasters; Safe-Cure Clear.
 - c. Conspec by Dayton Superior; W.B. Resin Cure.
 - d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
 - e. Edoco by Dayton Superior; Res X Cure WB.
 - f. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
 - g. Meadows, W. R., Inc.; 1100-CLEAR.
 - h. Nox-Crete Products Group; Resin Cure E.
 - i. Right Pointe; Clear Water Resin.
 - j. SpecChem, LLC; Spec Rez Clear.
 - k. Symons by Dayton Superior; Resi-Chem Clear.
 - l. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
 - m. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.8 RELATED MATERIALS

- A. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.9 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
- E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.10 FABRICATING REINFORCEMENT

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

2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.

- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 (ACI 318M) and ACI 301 (ACI 301M) for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

3.5 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide

joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.
 - 1. Apply scratch finish to surfaces indicated.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until

surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
 - b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases 6 inches ((150 mm)) high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.

5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

- b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
- 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
- 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one six month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1-part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

- D. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Steel reinforcement welding.
 - 3. Verification of use of required design mixture.
 - 4. Concrete placement, including conveying and depositing.
 - 5. Curing procedures and maintenance of curing temperature.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

- a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 8. Strength of each concrete mixture will be satisfactory if every average of any three-consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
 9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

END OF SECTION 033000

SECTION 04810 - UNIT MASONRYPART 1 - GENERAL1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of each type of masonry work is indicated on drawings and schedule.
- B. Types of masonry work required include:
 - (1) Reinforced unit masonry
 - (2) Concrete unit masonry
 - (3) Brick masonry
 - (4) Wall control joints (w.c.j.)
 - (5) Unit masonry reinforcement, anchors and accessories
 - (6) Mortar and grout for unit masonry
 - (7) Cavity-Wall Insulation.
- C. Foamed-In-Place Masonry Wall Insulation is specified in a Division 7 Section.
- D. Flashings and Joint Sealers related to Unit Masonry are specified in Division 7 Sections.

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
- B. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.
- C. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, (Per 2016 International Building Code), or by another means, as acceptable to authorities having jurisdiction.
- D. Field Constructed Mock-ups: Prior to installation of masonry work, erect sample wall panels to further verify selections made for color and textural characteristics, under sample submittals of masonry units and mortar, and to represent completed masonry work for qualities of appearance, materials and construction; build mock-ups to comply with the following requirements:
 - (1) Locate mock-ups on site in locations as directed by Architect.

- (2) Building mock-ups for the following types of masonry in sizes of approximately 4' long by 2' high by full thickness.
 - (a) Typical exterior face brick with areas depicting typical concrete block back-up.
 - (b) Retain mock-ups during construction as standard for judging completed masonry work. When directed, demolish mock-ups and remove from site.
- (3) Preconstruction Tests by Unit Test Methods: Test the following materials by methods indicated:
 - (a) Brick: Test each type and grade of brick per ASTM C 67. If coefficient of variation of compression samples tested exceeds 12%, obtain compressive strengths by multiplying average compressive strengths by $(1-1.5) \times (0.01 \times \text{coefficient of variation}) - (0.12)$.
 - (b) Concrete Masonry Units: Test each type, class and grade of concrete masonry unit per ASTM C 140.
 - (c) Mortar Tests: Test each mortar type per ASTM C 780.

1.04 SUBMITTALS

- A. Products data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with all specified requirements, including fire performance requirements.
- B. Samples for initial selection purposes: Submit samples of the following materials:
 - (1) Unit masonry samples in small scale form showing full extent of colors and textures available for each type of exposed masonry unit required.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes.
 - (1) Limit moisture absorption of concrete masonry units during delivery and until time of installation to the maximum percentage specified for Type I units for the average annual relative humidity as reported by the U.S. Weather Bureau Station nearest project site.
- C. Store cementitious materials off the ground, under cover and in dry location.
- D. Store aggregates where grading and other required characteristics can be maintained.
- E. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1.06 PROJECT CONDITIONS

- A. Protection of work: During erection, cover top of walls with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.

- B. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- C. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.
- D. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.
- E. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry.
- F. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
- G. Protect sills, ledges and projections from droppings of mortar.
- H. Cold weather protection:
 - (1) Do not lay masonry units which are wet or frozen.
 - (2) Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
 - (3) Remove masonry damaged by freezing conditions.
- I. For clay masonry units with initial rates of absorption (suction) which require them to be settled before laying, comply with the following requirements.
 - (1) For units with surface temperatures above 32 degrees F (0 degrees C), wet with water heated to above 70 degrees F (21 degrees C).
 - (2) For units with surface temperatures below 32 degrees F (0 degrees C), wet with water heated to above 130 degrees F (54 degrees C).
- J. Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperatures selected with 10 degrees F (6 degrees C).
 - (1) 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):
Mortar: Heat mixing water to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).
Grout: Follow normal masonry procedures.
 - (2) 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):
Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.
Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in place grout temperatures of 70 degrees F (21 degrees C) at end of work day.
 - (3) 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C):
Mortar: Heating mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.
Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in place grout temperature of 70 degrees F (21 degrees C) at end of work day.
Heat both sides of walls under construction using salamanders or other heat sources.
Use windbreaks or enclosures when wind is in excess of 15 mph.

- (4) 20 degrees F (-7 degrees C) and below:
 Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).
 Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in place grout temperature of 70 degrees F (21 degrees C) at end of work day.
 Masonry Units: Heat masonry units so that they are above 20 degrees F (-7 degrees C) at time of laying.
 Provide enclosure and auxiliary heat to maintain an air temperature of at least 40 degrees F (4 degrees C) for 24 hours after laying units.
 - (5) Do not heat water for mortar and grout to above 160 degrees F (71 degrees C).
- K. Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.
- (1) 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):
 Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.
 - (2) 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):
 Completely cover masonry with weather-resistive membrane for at least 24 hours.
 - (3) 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C):
 Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours grouted masonry.
 - (4) 20 degrees F (-7 degrees C) and below:
 Except as otherwise indicated, maintain masonry temperature above 32 degrees F (0 degrees C) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40 degrees F (4 degrees C) for 48 hours.

PART 2 - PRODUCTS

2.01 BRICK MADE FROM CLAY OR SHALE

- A. Comply with referenced standards and other requirements indicated below applicable to each form of brick required.
 - (1) Size: Provide bricks manufactured to the following actual dimensions:
 - (a) Standard Modular: 3-5/8" thick x 2-1/4" high x 7-5/8" long.
 - (2) For sills, caps and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view provide un-cored or un-frogged units with all exposed surfaces finished.
- B. Face Brick: ASTM C216, and as follows:
 - (1) Grade SW.
 - (2) Type FBS.
 - (3) Application: Use where brick is exposed, unless otherwise indicated.
 - (4) Texture and Color: Provide face brick of colors and textures as follows:

- C. For purpose of determining minimum performance and quality standards, face brick specification is based upon products as supplied by ACME Brick Company.
- (1) Equal products of other brick suppliers will be considered, subject to submission in accordance with Part 1 Section "Prior Approval".
 - (2) **Main Face Brick**: Face Brick (where denoted on the Drawings as "Face Brick") will be selected by the Architect using an allowance of **\$550.00 per thousand**.
 - (3) **Accent Soldier Course Brick**: Accent Brick (where denoted on Drawings as "Soldier Course Accent Brick.") shall be selected by the Architect using an allowance of **\$550.00 per thousand**.
- C. Building (Common) Brick: ASTM C 62, and as follows:
- (1) Grade SW.
 - (2) Application: Use where brick is indicated for concealed locations.

2.02 CONCRETE MASONRY UNITS

- A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.
- (1) Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
 - (2) Provide bull nose units for outside corners, except where specifically indicated on Drawings as square-edged units.
- B. **Concrete block**: Provide units complying with characteristics indicated below for grade, type, face size, exposed face and, under each form of block included, for weight classification.
- (1) Grade N except Grade S may be used above grade in exterior walls with weather protective coatings and in walls not exposed to weather.
 - (2) Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" high (15-5/8" x 7-5/8" actual) x thicknesses indicated.
 - (3) Type I, moisture-controlled units.
 - (a) Cure units by autoclave treatment at a minimum of 350 degrees F (176 degrees C) and a minimum pressure of 125 psi.
 - (4) Exposed faces: Manufacturer's standard color and texture, unless otherwise indicated.
 - (5) Hollow Load bearing Block: ASTM C90 and as follows:
 - (a) Weight Classification: Lightweight.
 - (b) Fire rated units where indicated.
- C. Concrete Building Brick: Provide units complying with ASTM C55 and characteristics indicated below for grade, type, size and weight classification.
- (1) Grade: Same as indicated for concrete block.
 - (2) Type: Same as indicated for concrete block.

- (3) Size: Standard Modular 2" x 3-5/8" x 7-5/8"
- (4) Weight Classification: Lightweight

2.03 MORTAR AND GROUT MATERIALS

- A. Portland cement: ASTM C150, Type I, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color.
 - (1) Mortar mix type and color shall be selected by the Architect using an allowance of **\$15.00 per bag** for all exposed face brick and accent brick applications.
- B. Hydrated lime: ASTM C207, Type S.
- C. Aggregate for mortar: ASTM C144, except for joints less than 3/8" use aggregate graded with 100% passing the No. 16 sieve.
 - (1) White Mortar Aggregates: Natural white sand or ground white stone.
- D. Aggregate for grout: ASTM C404.
- E. Water: Clean and potable.

2.04 ADJUSTABLE MASONRY VENEER ANCHORS

- A. GENERAL: Provide two-piece assemblies allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall, but resisting tension and compression forces perpendicular to fit; for attachment over sheathing to metal studs; and with the following structural performance characteristics:
 - (1) Structural Performance Characteristics: Capable of withstanding a 100 lb load in either tension or compression without deforming over, or developing play in excess of 0.05 inch.
- B. SCREW-ATTACHED MASONRY VENEER ANCHORS:
 - (1) Wire Tie Shape: Triangular; 3/16" diameter; hot-dipped galvanized.
 - (2) Wire Tie Length: As required to extend 1-1/2 inches minimum into masonry wythe of veneer face.
 - (3) Anchor Section: 14 gauge hot-dipped galvanized sheet metal plate, with screw holes top and bottom and with raised, rib-stiffened strap stamped into center to provide slot between strap and plate for connection of wire tie; of overall size indicated below.
 - (a) Size: Plate and strap size: 1-1/4 inches wide for plate, 5/8 inch for strap by lengths indicated below; slot clearance formed between face of plate and back of strap at maximum rib projection: 1/32 inch plus diameter of wire tie.
 - (b) Plate and Strap Lengths: 6 inches and 3-5/8 inches; with both sides of plate stiffened by ribs.
 - (c) Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene washer, #10 diameter by lengths required to penetrate steel stud flange by not less than 3 exposed threads, and with the following corrosion protective coating.
 - (1) Organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B117.

- (2) Screws for attachment of anchors to aluminum canopy columns shall be STAINLESS STEEL.
- (d) Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:
 - (1) Screw-attached Masonry Veneer Anchors; Heckmann Building Products; Hohmann & Barnard, Inc.; Wire-Bond.
- (e) Locations:
 - (1) At brick veneer over steel stud back-up framing with sheathing;
 - (2) At brick veneer or concrete unit masonry over cast-in-place concrete walls;
 - (3) See Drawings for extent.

2.05 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES

- A. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:
 - (1) Zinc-coated (galvanized) steel wire: ASTM A82 for uncoated wire and with ASTM A641 for zinc coating of class indicated below:
 - (a) Class 3 (0.80 oz. per sq. ft. of wire surface).
 - (b) Application: Use where indicated.
- B. Joint reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below:
 - (1) Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 2" elsewhere.
 - (2) For single-wythe and multi-wythe masonry provide type as follows with single pair of side rods:
 - (a) Truss design with continuous diagonal cross rods spaced not more than 16" o.c.
 - (3) For multi-wythe masonry with brick veneer or split-face concrete masonry veneer, provide type as follows:
 - (a) Ladder design with perpendicular cross spaced not more than 16" o.c. and number of side rods as follows: Three (3)
 - (b) Exterior Walls with Face Brick Veneer or Smooth-Face Concrete Masonry Veneer over Concrete Block: Equal to DUR-O-WAL "D/A 360" LADUR-EYE.
- C. Anchor bolts: Where wood blocking and other items are bolted to unit masonry, provide steel bolts with hex nuts and flat washers complying with ASTM A307, Grade A, hot-dip galvanized to comply with ASTM C153, Class C, in sizes and configurations indicated on drawings.
- D. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

AA Wire Products Co.
 Dur-O-Wall, Inc.
 Heckman Building Products, Inc.

Hohmann & Barnard, Inc.
Masonry Reinforcing Corp. of America
National Wire Products Corp.

2.06 CONCEALED FLASHING MATERIALS

- A. Sheet metal flashing: Sheet metal flashing is specified in Division 7, "Flashing and Sheet Metal".
- B. Membrane flashing: Membrane flashing is specified and furnished under Division 7, "Membrane Flashing". Installation of membrane flashing is specified in this section.

2.07 MASONRY CLEANERS

- A. Acidic cleaner: Manufacturer's standard strength general purpose cleaner designed for new masonry surfaces of type indicated; composed of blended organic and inorganic acids combined with special wetting of systems and inhibitors; expressly approved for intended use by manufacturer of masonry units being cleaned.
 - (1) Available products: Subject to compliance with requirements, a product which may be used to clean unit masonry surfaces includes, but is not limited to the following:
 - (a) "Sure Klean" No. 600 detergent; ProSoCo, Inc.
 - (b) Use products only as recommended by block manufacturer for cleaning colored concrete masonry units.

2.08 MORTAR AND GROUT MIXES

- A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.
 - (1) Do not use calcium chloride in mortar or grout.
- B. Mixing: Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.
- C. Mortar for unit masonry: Comply with ASTM C270, proportion specification, for types of mortar required, unless otherwise indicated.
 - (1) Limit cementitious materials in mortar to portland cement-lime.
 - (2) Use Type M mortar for masonry below grade and in contact with earth and where indicated.
 - (3) Use Type S mortar for reinforced masonry and where indicated.
- D. Grout for unit masonry: Comply with ASTM C476 for grout for use in construction of reinforced and non-reinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout.
 - (1) Use fine grout in grout spaces less than 2" in horizontal direction unless otherwise indicated.
 - (2) Use coarse grout in grout spaces 2" or more in least horizontal dimension unless otherwise indicated.

2.09 MISCELLANEOUS MASONRY ACCESSORIES

- A. Reinforcing Bars: Deformed steel, ASTM A615, Grade 60 for bars No. 3 to No. 18.
- B. Pre-molded control joint strips: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated on Drawings. Indicated as "W.C.J." on drawings.
 - (1) Polyvinyl chloride complying with ASTM D2287, General Purpose Grade, Type PVC 654-4.
- C. Anchors for connecting masonry to structural steel framework:
 - (1) General: Assemblies as detailed and/or noted on Structural Drawings.
 - (2) Products of Heckmann Building Products, Inc., or equal.
 - (3) Coordinate required anchor types with spray-on fireproofing system (if applicable).
- D. Weep Holes: 5/16" sash-type cotton weep cords (well greased) for use at all weep holes

2.10 CAVITY-WALL INSULATION

- A. Extruded-Polystyrene Board Insulation with Increased R-Value: ASTM C 578, Type IV, but with an aged thermal resistance (R-value) for 1.5 inch thickness of 5.6 deg F x h x sq. ft./Btu at 75 deg F at 5 years; closed-cell product with a carbon-black filler and extruded with an integral skin.
- B. Molded-Polystyrene Board Insulation: ASTM C 578, Type I.
- C. Adhesive: Type recommended by insulation board manufacturer for application indicated.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Wetting Clay Brick: Wet brick made from clay or shale which have ASTM C 67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute. Using wetting methods which ensure each clay masonry unit being nearly saturated by dry when laid.
- B. Do not wet concrete masonry units.
- C. Cleaning reinforcing: Before placing, remove loose rust, ice and other coatings from reinforcing.
- D. Thickness: Build cavity and composite walls, floors and other masonry construction to the full thickness shown. Build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness indicated.
- E. Build chases and recesses as shown or required for the work of other trades.
- F. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

- G. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full size units without cutting where possible.

(1) Use dry cutting saws to cut concrete masonry units.

3.02 CONSTRUCTION TOLERANCES

- A. Variation from plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4" in 10', or 3/8" in a story height not to exceed 20', nor 2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum, nor 2" in 40' or more. For vertical alignment of head joints do not exceed plus or minus 1/4" in 10', 3/8" maximum.
- B. Variation from level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 2" in 40' or more. For top surface of bearing walls do not exceed 1/8" between adjacent floor elements in 10' or 1-16" within width of a single unit.
- C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 2" in any bay or 20' maximum, nor 3/4" in 40' or more.
- D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" nor plus 2".
- E. Variation in mortar joint thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8" with a maximum thickness limited to 2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

3.03 LAYING MASONRY WALLS

- A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate openings, movement type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.
- B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.
- C. Concrete Unit Masonry Pattern Bond: Lay all exterior and interior exposed concrete unit masonry in **RUNNING BOND PATTERN**. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.
- D. Face Brick Pattern Bond: Unless specifically shown or noted otherwise on Drawings, lay exposed face brick in **RUNNING BOND PATTERN**, with vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.

- E. Stopping and Resuming Work: Rack back 2 of unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if specified to be wetted) and remove loose masonry units and mortar prior to laying fresh masonry.
- F. Built-In Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.
 - (1) Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
 - (2) Where the hollow metal frame and masonry work make contact, the joint shall be raked clear of mortar and sealed under Division 7 Section "Joint Sealants".
 - (3) All cells of the masonry units for the extent of door anchors shall be filled solid with mortar the height of jambs.
 - (4) Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
 - (5) Fill cores in hollow concrete masonry units with grout 3 courses (24") under bearing plates, beams, lintels, posts and similar items, unless otherwise indicated.

3.04 MORTAR BEDDING AND JOINTING

- A. Lay solid brick size masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.
- B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.
- C. Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.
- D. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.
- E. Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise indicated.
- F. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

3.05 STRUCTURAL BONDING OF MULTI-WYTHE MASONRY

- A. Use continuous horizontal joint reinforcement installed in horizontal mortar joints for bond tie between wythes. Install at not more than 16" o.c. vertically.
- B. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.
 - (1) For horizontally reinforced masonry, provide continuity at corners with prefabricated "L" units, in addition to masonry bonding.

- C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:
- (1) Provide continuity with horizontal joint reinforcement using prefabricated "T" units.
- D. Non-bearing Interior Partitions: Build to a height indicated on Drawings, except where indicated to be built tight to underside of roof deck above.
- (1) Wedge non-bearing partitions against structure above with small pieces of tile, slate or metal. Fill joint with mortar after dead load deflection of structure above approaches final position.
 - (2) At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "Fire-Safing."

3.06 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes or tab-type reinforcement.
 - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
 2. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Keep cavity clean of mortar droppings and other materials during construction. Strike joints facing cavity flush.
- C. Tie exterior wythe to back-up with continuous horizontal joint reinforcing, installed in mortar joints at not more than 16" o.c. vertically.
- D. Coat cavity face of backup wythe to comply with Division 7 Section "Bituminous Damp-proofing."
- E. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry, cast-in-place concrete or other construction as shown.
1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry or concrete substrate.
- F. Provide weep holes in exterior wythe of cavity wall located immediately above ledges and flashing, spaced 2'-0" o.c. unless otherwise indicated.

3.07 HORIZONTAL JOINT REINFORCEMENT

- A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 2" elsewhere. Lap reinforcing a minimum of 6".
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted to be omitted.
- D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- E. Space continuous horizontal reinforcement as follows:
 - (1) For multi-wythe walls (solid or cavity) where continuous horizontal reinforcement acts as structural bond or tie between wythes, space reinforcement as required by code, but not more than 16" o.c. vertically.
 - (2) For single-wythe walls, space reinforcement at 16" o.c. vertically unless otherwise indicated.
- F. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening except at control joints.
 - (1) In addition to wall reinforcement, provide additional reinforcement at openings as required to comply with the above.

3.08 ANCHORING MASONRY TO STRUCTURAL STEEL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural steel members to comply with the following:
 - (1) Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
 - (2) Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
 - (3) Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.09 ANCHORING SINGLE-WYTHER MASONRY VENEER TO METAL STUDS

- A. Anchor single-wythe masonry veneer to sheathed metal studs, cast-in-place concrete or fully grouted masonry, with masonry veneer anchors to comply with the following requirements:
 - (1) Fasten each anchor section through sheathing to metal studs, concrete or masonry with 2 metal fasteners of type indicated.
 - (2) Embed tie section in masonry joints. Provide not less than 1-1/2" air space between back of masonry veneer wythe and face of sheathing.

- (3) Locate anchor section relative to course in which tie section is embedded to allow maximum vertical differential movement of tie up and down.
- (4) Space anchors as indicated but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 1'-0" of openings and at intervals around perimeter not exceeding 8 inches.

3.10 INSTALLATION OF REINFORCED UNIT MASONRY

- A. General: Install reinforced unit masonry to comply with requirements of referenced unit masonry standard and Structural Drawings and Specifications.
- B. Temporary Formwork: Construct formwork and shores to support reinforced masonry elements during construction.
 - (1) Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
- C. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
- D. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

3.11 CONTROL AND EXPANSION JOINT

- A. General: Provide vertical and horizontal expansion, control and isolation joints in masonry where shown. Build-in as the masonry work progresses.
- B. Build-in non-metallic joint fillers at locations indicated on Drawings.

3.12 LINTELS

- A. Install steel lintels where indicated. See Architectural and Structural Drawings.
- B. Provide masonry lintels where shown and wherever openings of more than 1'0" for brick size units and 2'0" for block size units are shown without structural steel or other supporting lintels. Provide pre-cast or formed-in-place masonry lintels. Cure pre-cast lintels before handling and installation. Temporarily support formed-in-place lintels.
 - (1) For hollow concrete masonry unit walls, use specially formed U-shaped lintel units with reinforcement bars placed as shown filled with coarse grout. See Architectural and Structural drawings.
- C. Provide minimum bearing of 8" at each jamb unless otherwise indicated.

3.13 FLASHING OF MASONRY WORK

- A. General: Provide concealed flashing in masonry work at or above shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover

with mortar. Seal penetrations in flashing with mastic before covering with mortar. Extend flashings through exterior face of masonry and turn down to form drip.

- B. Extend flashing the full length of lintels and shelf angles and minimum of 4" into masonry each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4" and through the inner wythe to within 5/8" of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2". At heads and sills turn up ends not less than 2" to form a pan.
- C. Interlock end joints of deformed metal flashings by overlapping deformations not less than 1-1/2" and seal lap with elastic sealant.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry or concrete.
- D. Provide specified weep holes in the head joints of the first course of masonry immediately above concealed flashings. Space 24" o.c., unless otherwise indicated.

3.14 REPAIR, POINTING AND CLEANING

- A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Pointing up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:
 - (1) Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
 - (2) Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
 - (3) Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 - (4) Use bucket and brush hand cleaning method described in BIA "Technical Note No. 20 Revised" to clean brick masonry made from clay or shale, except use masonry cleaner indicated below.
 - (a) Acidic Cleaner; apply in compliance with directions of cleaner manufacturer.
 - (5) Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.
- D. Protection: Provide final protection and maintain conditions in a manner acceptable to installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

SECTION 04850 - MEMBRANE FLASHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Membrane flashing shall be installed at locations as shown on drawings.

1.03 RELATED SECTIONS

- A. Division 4, Section 04810 "Unit Masonry"

1.03 SUBMITTALS

- A. Furnish sample and manufacturer's data for Architect's approval.

PART 2 - PRODUCTS

2.01 MATERIALS – GENERAL

- A. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
 - 1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.
 - a. Available Products:
 - 1) Advanced Building Products Inc.; Peel-N-Seal.
 - 2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - 3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier-44.
 - 4) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
 - 5) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
 - 6) Hohmann & Barnard, Inc.; Textroflash.
 - 7) Polyguard Products, Inc.; Polyguard 300.
 - 8) Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
 - 9) Williams Products, Inc.; Everlastic MF-40.
 - 2. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymers alloy as follows:
 - a. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch thick.
 - b. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch-thick coating of rubberized-asphalt adhesive.

- c. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch- thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches from edge.
 - 1) Color: Black.
 - d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
 - 1) Hyload, Inc.; Hyload Cloaked Flashing System, or approved equal.
3. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.
- a. Available Products:
 - 1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
 - 2) Firestone Building Products; FlashGuard.
 - 3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.
 - B. Adhesives, Primers and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All surfaces to receive the flashing shall be reasonably smooth and free from irregularities. On all horizontal surfaces, the flashing shall be laid above a trowel coat of mastic. Vertical surfaces shall be spot tacked, to hold flashing in place.
- B. Installation shall be done under Division 4 Unit Masonry Section.

END OF SECTION 04850

SECTION 051200 - STRUCTURAL STEEL 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. Structural steel.
- B. Related Sections:
 - 1. Section 014000 "Quality Requirements" for independent testing agency procedures and administrative requirements.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC 360.
 - 2. Use ASD; data are given at service-load level.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.

2. Include embedment drawings.
 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 5. For structural-steel connections indicated to comply with design loads, include structural analysis data.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer fabricator professional engineer testing agency.
- B. Welding certificates.
- C. Product Test Reports: For the following:
1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 2. Direct-tension indicators.
 3. Tension-control, high-strength bolt-nut-washer assemblies.
 4. Shear stud connectors.
 5. Shop primers.
- D. Source quality-control reports.

1.7 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- B. Comply with applicable provisions of the following specifications and documents:
1. AISC 303.
 2. AISC 341 and AISC 341s1.
 3. AISC 360.
 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.8 DELIVERY, STORAGE, AND HANDLING

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

1.9 COORDINATION

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

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels, Angles, S-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- E. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
- B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- C. Unheaded Anchor Rods: ASTM A 36/A 36M.
 - 1. Configuration: Hooked.
 - 2. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 5. Finish: Plain.
- D. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 4. Finish: Plain.
- E. Threaded Rods: ASTM A 36/A 36M.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 2. Washers: ASTM A 36/A 36M carbon steel.
 - 3. Finish: Plain.

2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

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

2.5 FABRICATION

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

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.

- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.8 GALVANIZING

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

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened.

- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.
- E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

END OF SECTION 051200

SECTION 053100 - STEEL DECKING

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. Roof deck.
- 2. Composite floor deck.

- B. Related Requirements:

- 1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:

- 1. Roof deck.
- 2. Composite floor deck

- B. Shop Drawings:

- 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
 - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 ROOF DECK

- A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 (230) G60 (Z180) zinc coating.
 - 2. Deck Profile: As indicated.
 - 3. Profile Depth: 1-1/2 inches (38 mm) 2 inches (190 mm).
 - 4. Design Uncoated-Steel Thickness: As indicated.
 - 5. Span Condition: Triple span or more.
 - 6. Side Laps: Overlapped.

2.3 COMPOSITE FLOOR DECK

- A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
2. Profile Depth: 3 inches (76 mm).
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: As indicated.

2.4 ACCESSORIES

- A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile indicated.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- I. Galvanizing Repair Paint: ASTM A780/A780M.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

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

3.3 INSTALLATION OF ROOF DECK

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:
 - 1. Weld Diameter: 5/8 inch (16 mm), nominal.
 - 2. Weld Spacing: as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches (457 mm), and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 - 1. End Joints: Lapped 2 inches (51 mm) minimum.
- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.4 INSTALLATION OF FLOOR DECK

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: 5/8 inch (16 mm), nominal.
 - 2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches (914 mm), and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 - 1. End Joints: Lapped.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Prepare test and inspection reports.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED 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. This Section includes the following:
 - 1. Exterior non-load-bearing wall framing.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
 - 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1/2 inch.
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
 - 2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
 - 3. Roof Trusses: Design according to AISI's "Standard for Cold-Formed Steel Framing - Truss Design."

1.4 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal trusses; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 1. For cold-formed metal trusses indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.
- D. Qualification Data: For professional engineer and testing agency.
- E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.
- F. Research/Evaluation Reports: For cold-formed metal framing.

1.5 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

- E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Allied Studco.
 - 2. AllSteel Products, Inc.
 - 3. California Expanded Metal Products Company.
 - 4. Clark Steel Framing.
 - 5. Consolidated Fabricators Corp.; Building Products Division.
 - 6. Craco Metals Manufacturing, LLC.
 - 7. Custom Stud, Inc.
 - 8. Dale/Incor.
 - 9. Design Shapes in Steel.
 - 10. Dietrich Metal Framing; a Worthington Industries Company.
 - 11. Formetal Co. Inc. (The).
 - 12. Innovative Steel Systems.
 - 13. MarinoWare; a division of Ware Industries.
 - 14. Quail Run Building Materials, Inc.
 - 15. SCAFCO Corporation.
 - 16. Southeastern Stud & Components, Inc.
 - 17. Steel Construction Systems.

18. Steeler, Inc.
19. Super Stud Building Products, Inc.
20. United Metal Products, Inc.

2.2 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 1. Grade: As required by structural performance.
 2. Coating: G60, A60, AZ50, or GF30.
- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 1. Grade: As required by structural performance.
 2. Coating: G90.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: as indicated.
 2. Flange Width: as indicated.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: Matching steel studs.
 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dietrich Metal Framing; a Worthington Industries Company.
 - b. MarinoWare, a division of Ware Industries.
 - c. SCAFCO Corporation
 - d. The Steel Network, Inc.
 - e.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Minimum Base-Metal Thickness: as indicated.

3. Flange Width: **1 inch** plus twice the design gap for other applications.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
 1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: as indicated.
 - b. Flange Width: **1 inch** plus twice the design gap for other applications **<Insert dimension>**.
 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: as indicated.
 - b. Flange Width: as indicated

2.4 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.
 8. Stud kickers, knee braces, and girts.
 9. Joist hangers and end closures.
 10. Hole reinforcing plates.
 11. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

- A. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, non-staining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- B. Shims: Load bearing, high-density multi-monomer plastic, non-leaching.
- C. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
 - 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

- C. Fabrication Tolerances: Fabricate assemblies' level, plumb, and true to line to a maximum allowable tolerance variation of **1/8 inch in 10 feet** and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus **1/8 inch** from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of **1/8 inch**.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding **1/16 inch**.
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
 1. Cut framing members by sawing or shearing; do not torch cut.
 2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of **1/8 inch in 10 feet** and as follows:
 1. Space individual framing members no more than plus or minus **1/8 inch** from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
 1. Stud Spacing: As indicated.
 2. Stud Spacing: As indicated.

- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to infill studs and anchor to building structure.
 - 4. Connect drift clips to cold formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than **48 inches** apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within **12 inches** of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - a. Install solid blocking at **96-inch** centers.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 054400 - COLD-FORMED METAL TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Roof trusses.

1.2 ACTION SUBMITTALS

- A. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel trusses; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- B. Delegated-Design Submittal: For cold-formed steel trusses.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product test reports.
- C. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel trusses.
- B. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated on Drawings.
 - 2. Deflection Limits: Design trusses to withstand design loads without deflections greater than the following:
 - a. Roof Trusses: Vertical deflection of 1/240 of the span.
- C. Cold-Formed Steel Truss Standards: Unless more stringent requirements are indicated, trusses shall comply with the following:
 - 1. Roof Trusses: AISI S214.

2.2 COLD-FORMED STEEL TRUSS MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60 (Z180), A60 (ZF180)

2.3 ROOF TRUSSES

- A. Roof Truss Members: Manufacturer's standard C-shaped steel sections.
 - 1. Connecting Flange Width: 1-5/8 inches (41 mm), minimum at top and bottom chords connecting to sheathing or other directly fastened construction.
 - 2. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm)

2.4 TRUSS ACCESSORIES

- A. Fabricate steel-truss accessories from steel sheet, ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for truss members.
- B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

2.5 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.
- B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel headless, hooked bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.
- C. Power-Actuated Fasteners: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780/A780M.
- B. Shims: Load-bearing, high-density multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as truss members supported by shims.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed steel trusses without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

3.2 INSTALLATION

- A. Install bridge, and brace cold-formed steel trusses according to AISI S200, AISI S202, AISI S214, and manufacturer's written instructions unless more stringent requirements are indicated.

1. Coordinate with wall framing to align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure.
 2. Install continuous bridging and permanently brace trusses as indicated on Drawings, as indicated on Shop Drawings and designed according to CFSEI's Technical Note 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses."
- B. Install cold-formed steel trusses and accessories true to line and location, and with connections securely fastened.
- C. Install temporary bracing and supports to secure trusses and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to trusses are secured.
- D. Truss Spacing: As indicated on Drawings.

3.3 ERECTION TOLERANCES

- A. Install cold-formed steel trusses level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
1. Space individual trusses no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel trusses with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform inspections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Cold-formed metal trusses will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 054400

SECTION 05500 – METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including General and Supplementary (or Special) Conditions and Part 1 Specification Sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

- A. Extent of work is indicated on Drawings.
- B. This section includes the following metal fabrications:
 - (1) Bearing and leveling plates.
 - (2) Loose steel lintels.
 - (3) Miscellaneous framing and supports.
 - (4) Rough hardware.
 - (5) Downspout Boots
- C. Exterior and Interior Steel Handrails and Railings are specified in Division 5 Section 05720 "Handrails and Railings."
- D. Exterior and Interior Floor, Wall and Ceiling Expansion Joint Covers (F.E.J. / W.E.J. / C.E.J.) are specified in a Division 7 Section.
- E. Gratings and Frames for New Storm Sewer Systems are specified in Division 2 Sections and on Civil Drawings.
- F. Cast-in-Place Concrete is specified in a Division 3 Section.
- G. Painting of Metal Fabrications is specified in Division 9 Section 09900 "Painting."

1.03 SUBMITTALS

- A. General: Submit the following in accordance with conditions of contract and Division 1 Specification sections.
- B. Product Data and 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 section.

1.04 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.
- B. Quality 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".

- (1) Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.05 PROJECT CONDITIONS

- A. Field measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in work.

PART 2 - PRODUCTS

2.01 FERROUS METALS

- A. 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.
- B. Steel plates, shapes, and bars: ASTM A 36.
- C. Uncoated Structural Steel Sheet: Product type (manufacturing method), quality, and grade as follows:
 - (1) Cold-Rolled Structural Steel Sheet: ASTM A 611, grade as follows:
 - (a) Grade A, unless otherwise indicated or required by design loading.
 - (2) Hot-Rolled Structural Steel Sheet: ASTM A 570, grade as follows:
 - (a) Grade 30, unless otherwise indicated or required by design loading.
- D. Uncoated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:
 - (1) Cold-Rolled Steel Sheet: ASTM A 366.
 - (2) Hot-Rolled Steel Sheet: ASTM A 569.
- E. Galvanized Steel Sheet: Quality as follows:
 - (1) Commercial Quality: ASTM A 526, G90 coating designation unless otherwise indicated.
- F. Cold-Formed Steel Tubing: ASTM A 500.
 - (1) For exterior installations, where indicated on Drawings, provide tubing, plates and shapes with hot-dip galvanized coating per ASTM A 53.
- G. Gray Iron Castings: ASTM A 48, Class 30.
- H. Malleable Iron Castings: ASTM A 47, grade 32510.
- I. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported items, unless otherwise indicated.

- J. Stainless Steel: AISI Type 302/304, complying with ASTM A 167, 2D annealed finish, soft, except where harder temper required for forming or performance; 26 Gage.
- K. 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.
- L. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

2.02 ALUMINUM

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T6.

2.03 GROUT AND ANCHORING CEMENT

- A. Non-shrink Metallic Grout: Premixed, factory-packaged, ferrous aggregate grout complying with CE CRD-C 621, specifically recommended by manufacturer for heavy duty loading applications of type specified in this section.
- B. Non-shrink Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout complying with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- C. Erosion-Resistant Anchoring Cement: Factory-prepackaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.
- D. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include but are not limited to the following:
 - (1) Non-shrink Metallic Grouts:
"Hi Mod Grout"; Euclid Chemical Co.
"Embeco 885 and 636"; Master Builders
"Ferrolith G Redi-Mix and G-NC"; Sonneborn Building Products Div.
 - (2) Non-shrink Nonmetallic Grouts:
"Euco N-S Grout"; Euclid Chemical Co.
"Masterflow 713"; Master Builders
"SonogROUT"; Sonneborn Building Products Div.,
 - (3) Erosion-Resistant Anchoring Cement
"Super Por-Rok"; Minwas Construction Products Division

2.04 FASTENERS AND MISCELLANEOUS MATERIALS

- A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A.
- C. Lag Bolts: Square head type, FS FF-B-561.

- D. Machine Screws: Cadmium plated steel, FS FF-S-92.
- E. Wood Screws: Flat head carbon steel, FS FF-S-111.
- F. Plain Washers: Round, carbon steel, FS FF-W-92.
- G. Drilled-in Expansion Anchors: Expansion anchors complying with FS FF-S-325, Group VIII (anchors, expansion, non-drilling), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade 5.
- H. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
- I. Lock Washers: Helical spring type carbon steel, FS FF-W-84.
- J. Solder: For use with stainless steel, provide 60-40 tin/lead solder (ASTM B 32), with acid-chloride type flux, except use rosin flux over tinned surfaces.
- K. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gage required for performance.

2.05 PAINT

- A. 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.
- B. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.
- C. Zinc Chromate Primer: FS TT-P-645.

2.06 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Allow for thermal movement resulting from the maximum change (range) in ambient temperature in the design, fabrication and installation of installed metal assemblies to prevent buckling, opening up of joints, and over stressing of welds and fasteners.
- D. Shear and punch metals cleanly and accurately. Remove burrs.
- E. 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.

- F. Remove sharp or rough areas on exposed traffic surfaces.
- G. Weld corners and seams continuously to comply with AWS recommendations and the following:
 - (1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - (2) Obtain fusion without undercut or overlap.
 - (3) Remove welding flux immediately.
 - (4) At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- K. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.07 ROUGH HARDWARE

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.08 BEARING AND LEVELING PLATES

- A. Provide bearing and leveling plates (if any) 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.

2.09 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

2.10 CAST IRON DOWNSPOUT BOOTS

- A. Provide Cast Iron Downspout Boots as manufactured by J.R. Hoe, or equal in 4"x5" inlet size, A-Series x length as required (or Series and length as required to fit specific condition) at locations as indicated on the drawings. See Civil drawings for continuation of storm drainage beyond downspout boot.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.
- B. 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.

2.12 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish metal fabrications after assembly.

2.13 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process compliance with the following requirements:
 - (1) ASTM A 153 for galvanizing iron and steel hardware.
 - (2) ASTM A 123 for galvanizing both fabricated and un-fabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - (1) Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning".
 - (2) Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".
- C. 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 requirement of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instruction, 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.
- B. Set Sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.02 INSTALLATION, GENERAL

- A. Fastening to In-place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, fitting and placement: Perform cutting, drilling and fitting required for 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.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- E. 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:
 - (1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - (2) Obtain fusion without undercut or overlap.
 - (3) Remove welding flux immediately.
 - (4) At exposed connections, finish exposed welds and surfaces smooth and blend so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- F. Corrosion Protection: Coat concealed surfaces of aluminum or stainless steel that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

3.03 SETTING LOOSE PLATES AND ANGLES

- A. Clean concrete and masonry bearing surfaces of any bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates and angles on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
 - (1) Use metallic non-shrink grout in concealed locations where not exposed to moisture; use nonmetallic non-shrink grout in exposed locations, unless otherwise indicated.
 - (2) Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.05 ADJUSTING AND CLEANING

- A. 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.
- B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05720 - HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Extent of work is indicated on Drawings and as follows:
- (1) New Exterior Steel Tube Handrails, Protective Railings and Enclosure Fencing at Steps, Courtyard and Ramp as indicated on Drawings.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
- (1) Division 5 Section 05500 "Metal Fabrications"
 - (2) Division 9 Section 09911 "Painting".

1.03 DEFINITIONS

- A. General: In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
- (1) Cold-formed Structural Steel: AISI "Specification for the Design of Cold-formed Steel Structural Members".
- B. Structural Performance of Railing Systems: Engineer, fabricate, and install railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems. Requirements are based on the 1994 Standard Building Code.
- (1) Top Rail of System: Capable of withstanding the following loads applied as indicated:
 - (a) Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
 - (b) Uniform load of 50 lbf per linear foot (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf per linear foot (1460 N/m) applied vertically downward.
 - (c) Concentrated and uniform loads above need not be assumed to act concurrently.
 - (2) Handrails not serving as Top Rails: Capable of withstanding the following loads applied as indicated:
 - (a) Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
 - (b) Uniform load of 50 lbf per linear foot (730 N/m) applied in any direction.
 - (c) Concentrated and uniform loads above need not be assumed to act concurrently.

- (3) Infill area of Railing Systems: Capable of withstanding a horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in the system, including panels, intermediate rails, balusters, or other elements composing the infill area.
 - (a) Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress on guard.
- (4) Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.04 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specifications Sections.
- B. Product data for manufacturer's product lines of handrails and railing systems assembled from standard components. Submit product data for grout, anchoring cement, and paint products.
- C. Shop drawings showing fabrication and installation of handrails and railings, including plans, elevations, sections, details of components, and attachments to other units of Work.
 - (1) For installed handrails and railing systems indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.
- D. Samples for initial selection in the form of short sections of railing or flat sheet metal samples showing available mechanical finishes.
- E. Samples for verification of each type of exposed finish required. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
- F. Product test reports from a qualified independent testing agency evidencing compliance of handrails and railing systems with requirements based on comprehensive testing of current products.

1.05 QUALITY ASSURANCE

- A. Single-source Responsibility: Obtain primary handrails and railing systems of each type and material from a single manufacturer.

1.06 STORAGE

- A. Store handrails and railing systems inside a well-ventilated area, away from uncured concrete and masonry and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Where handrails and protective railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.08 SEQUENCING AND SCHEDULING

- A. Sequence and coordinate installation of exterior protective railings and handrails as follows:
- (1) Mount exterior handrails at steps, protective railings at Patio and ramp handrails only on completed concrete work properly prepared to receive railings. Do not support handrails temporarily by any means not satisfying structural performance requirements. See details and elevations for handrail mounting methods.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering handrails and railing systems that may be incorporated in the Work include, but are not limited to, the following:
- (1) Protective Railings at Patio, Step and Ramp Handrails:
Steel pipe, post-mounted protective railings and handrails fabricated in diameter, lengths and configuration as shown on elevations and sections.

2.02 METALS

- A. General: Provide metal free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.
- B. Steel and Iron: Provide steel and iron in the form indicated complying with the following requirements:
- (1) Steel Tubing: Product type (manufacturing method) and other requirements as follows:
 - (a) Cold-formed Steel Tubing: ASTM A 500, grade as indicated below:
Grade A, unless otherwise indicated or required by structural loads.
 - (b) Hot-formed Steel Tubing: ASTM A 501.
 - (2) Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - (3) Gray Iron Castings: ASTM A 48, Class 30.
 - (4) Malleable Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).
- C. Brackets, Flanges, and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

2.03 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for

good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

2.05 FABRICATION

- A. General: Fabricate handrails to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacing, and anchorage, but not less than that required to support structural loads.
- B. Assemble railing systems in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping, handling and placement limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Form changes in direction of railing members as follows:
 - (1) By radius bends of radius indicated.
 - (2) By mitering at elbow bends.
- D. Welded Connections: Fabricate steel railing systems and handrails for connecting members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:
 - (1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - (2) Obtain fusion without undercut or overlap.
 - (3) Remove welding flux immediately.
 - (4) At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- E. Brackets, Flanges, Fittings, and Anchors: Provide brackets and anchors to connect handrail and railing members to other construction as shown on the drawings.
- F. Close exposed ends of handrail and railing members with prefabricated end fittings.

2.06 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering prior to shipment.
- C. 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 the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and they are assembled or installed to minimize contrast.

2.08 IRON AND STEEL FINISHES

- A. For non-galvanized steel handrails and railing systems, provide non-galvanized ferrous metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed railings:
 - (1) Exteriors (SSPC Zone 1B): SSPC-SP 6 Commercial Blast Cleaning.
- C. Apply shop primer to prepared surfaces of handrails and railing components, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 - (1) Paint all edges, corners, crevices, bolts, welds, and sharp edges at exterior railings.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Fit exposed connections accurately together to form tight, hairline joints.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing handrails and railings. Set handrails and railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.
 - (1) Do not weld, cut, or abrade surfaces of handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.
 - (2) Set posts plumb within a tolerance of 1/4 inch in 12 feet (2 mm in 1 m).
 - (3) Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (2 mm in 1 m).
- C. Field Welding: Comply with the following requirements:
 - (1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - (2) Obtain fusion without undercut or overlap.
 - (3) Remove welding flux immediately.
 - (4) At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- D. Adjust handrails prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by structural loads.
- E. Fastening to In-place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings systems and for properly transferring loads

to in-place construction.

3.02 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact, or use fittings designed for this purpose.

3.03 ADJUSTING AND CLEANING

- A. Painting: Painting of all steel tube railings is specified in Division 9.
- B. Touch-up Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9.

3.04 PROTECTION

- A. Protect finishes of railing systems and handrails from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire units, or provide new units.

END OF SECTION 05720

SECTION 06100 - ROUGH & FINISH CARPENTRY

PART I - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division I Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

- A. Definition: Rough and finish carpentry includes carpentry not specified as part of other sections which may be covered by other work. Types of rough and finish carpentry included in this section are:
 - (1) Wood framing and blocking.
 - (2) Plastic laminate for *Casework* counters.
 - (3) Plywood backing panels or backboards
 - (4) Ornamental Decorative Fypon Dentil Blocks at Soffits.
- B. Related Section: Section 12345 Casework for Reception 101, Supplies 105, Coffee Bar 108, Crafts/Cards 115, Billiards/Cards 120, Cabinets at Kitchen 128, Men's Toilet 131, Custodial 132 and Women's Toilet 133.

1.03 SUBMITTALS

- A. Wood treatment data: Submit treatment manufacturer's instructions for proper use of each type of treated material.
 - (1) Pressure Treatment: For each type specified, include certification by treating plant stating chemicals and process used, net amount of preservative retained and conformance with applicable standards.
 - (2) For Water-borne Preservatives, include statement that moisture content of treated materials was reduced to a max. of 15% prior to shipment to project site.

1.04 MATERIAL HANDLING AND PROTECTION

- A. All lumber and carpentry items shall be handled and stacked off the ground so as to protect them against damage. They shall be protected from the weather while in transit and after delivery to the site. All other material such as nails, bolts, etc. shall be protected and not allowed to rust. Store materials at temperature and humidity conditions recommended by manufacturers.

PART II - MATERIALS

2.01 GENERAL

- A. Lumber which is to become a permanent part of the building shall be No. 2 common dimension Southern Yellow Pine, S4S to standard yard sizes and shall, where necessary, be job or mill ripped to sizes indicated on Drawings. Lumber shall be kiln dried to a moisture content of 19% or less. Lumber required to be treated shall be pressure treated with Wolman salts or approved equal, to a net retention of 0123 lbs. per cu. ft. in accordance with FS TT-W-571. Treated lumber shall be so marked. If

- lumber is cut or sawed after treating shall be brush-coated or dipped with same preservative used at plant.
- B. All other lumber (stud wall blocking, plates other than pressure treated, etc.) which is to become a permanent part of the building in this category, shall be No. 2 common dimension Spruce, S4S to standard yard sizes and shall, where necessary, be job or mill ripped for sizes indicated on the Drawings.
- C. Plywood:
- (1) APA Grade "C-D", exterior glue, conforming to PSI-83, except A-D Grade at interior counters to receive plastic laminate.
- D. Bolts, nuts and washers shall be non-corroding type. Types and sizes shall be as indicated on Drawings or as required to complete the Work.
- E. Nails shall comply with FS FF-N-101 and shall be cement coated, except use finishing type at finish carpentry items.
- F. Plastic laminate top, vertical facings, and edges over plywood backing for counters:
- (1) Plastic laminate shall be NEMA with satin finish as manufactured by Formica, Wilson-Art, Nevamar, or approved equal, in standard colors and pattern selected by Architect.
- (a) General purpose grade: .050" thick, NEMA LD3-1980, type GP-50.
- G. Ornamental Decorative Dentil Blocks:
- (1) Decorative Dentil Block.
- a. Nominal Size: 5" W x 3 3/8" H x 7 3/4" L
- b. Acceptable Manufacturer: Equal to Fypon, Ltd. "DTLB4X5X8" as distributed by The Architectural Depot @ architecturaldepot.com
- c. Dentil Blocks are to be placed a nominal 24" o.c. at soffit locations of the Main Building as shown on the elevations and secured to ventilated soffit system and pre-finished metal frieze.

PART III - EXECUTION

3.01 INSTALLATION: Execute rough and finish carpentry in best substantial manner. Size framing, blocking, furring, panels, etc. as shown. Bolt to concrete and masonry as shown. Bolts shall be drawn up tight; countersink and fill bolts and nails at exposed locations. Thoroughly secure framing, panels and trim. Install blocking wherever shown or as required to maintain framing rigid, or provide adequate substrate for paneling and trim application.

3.02 INSTALLATION OF PLYWOOD

- A. Comply with recommendations of American Plywood Association (APA).

END OF SECTION 06100

SECTION 06160 - SHEATHING

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. Glued-laminated wood sheathing (plywood wall sheathing).
2. Fiberglass-mat faced, moisture resistant gypsum sheathing.
3. Plywood
4. Plywood and gypsum sheathing accessories.
5. Plywood decking.

B. Related Sections:

1. Division 5 Section 05400 "Cold Formed Framing" and Division 9 Section 09250 "Gypsum Drywall" for light-gauge steel stud and joist framing to receive plywood or glass mat gypsum sheathing board.
2. Division 6 Section 06100 "Rough Carpentry" for dimension lumber items associated with wood sheathing and gypsum sheathing.
3. Division 7 Section 07240 "Exterior Insulation and Finish System" for installing glass mat gypsum board sheathing integral with exterior insulation and finish system.
4. Division 7 Section 073113 "Asphalt Shingles" for installing plywood decking integral to vented nail-base insulation installed with shingle roofing system.

1.3 DEFINITIONS

- A. Plywood grading agencies, and the abbreviations used to reference them, include the following:

1. APA: The Engineered Wood Association.
2. AWP: American Wood Preservers' Association.
3. SPIB: The Southern Pine Inspection Bureau.

- B. IBC: 2021 International Building Code

1.4 REFERENCES

- A. ASTM International (ASTM):

1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.
2. ASTM C518 Standard Test Methods for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

3. ASTM C1002 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.
4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
5. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.
6. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
7. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

B. Gypsum Association:

1. GA-254 Application of Gypsum Sheathing.

1.5 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery of wood decking and gypsum sheathing to avoid extended on-site storage and to avoid delaying the Work.
- B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood decking and gypsum sheathing with surfaces that are to be exposed in the final Work protected from exposure to sunlight.
- C. When handling plywood, avoid dropping panels on edges to prevent splintering or chipping.

1.7 JOB CONDITIONS

- A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring strips, nailers, blocking, framing members and similar supports to allow proper attachment other work.
- B. Once wood material has been installed, protect by applying temporary covering, siding and roofing as soon as possible.
- C. All pressure-preservative-treated lumber shall not to come in direct contact with any metal components, including steel decking. All treated wood blocking, nailers, framing members, curb supports, decking and plywood sheathing must be separated from metals with one

course of elastomeric underlayment unless an alternate method of separation is indicated or specified in other divisions of this Project Manual.

1.8 WARRANTY

- A. Provide gypsum sheathing products that offer twelve (12) months of coverage against in-place exposure damage (delamination, deterioration and decay).
- B. Manufacturer's Warranty:
 - 1. Five (5) years against manufacturing defects.

PART 2 - PRODUCTS

2.1 WOOD DECKING, GENERAL

- A. General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

2.2 WOOD-PRESERVATIVE-TREATED

- A. Preservative Treatment by Pressure Process: AWPAC2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPAC31 with inorganic boron (SBX)].
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Plywood, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.3 GLUED-LAMINATED WOOD SHEATHING

- A. Provide engineered wood products that comply with APA standards; The Engineered Wood Construction Guide. Only products bearing the APA trademark will be accepted for use on this project.
 - 1. Laminating Adhesive: Wet-use type complying with ASTM D 2559.
 - 2. Species: Southern pine.
 - 3. Grade: C-D Group 1
 - 4. Exposure Durability Classification: Exterior

5. Decking Nominal Size: 4 x 8.
6. Nominal Thicknesses: ½ inch or ¾ inch, as indicated on drawings.
7. Edge Pattern: Square-edge.

2.4 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils thick minimum, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
 2. Low Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
 3. Products:
 - a. Carlisle Coatings & Waterproofing, Div. of Carlisle Companies Inc.; Dri-Start "HR" High Performance Roofing Underlayment.
 - b. Grace, W. R. & Co.; Vycor Ultra.
 - c. Henry Company; Perma-Seal PE.

2.5 WOOD SHEATHING FASTENERS

- A. Provide fastener size, spacing and type complying with recommendations of American Plywood Association, and the following:
1. Where 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.
 2. Nails, Wire, Brads and Staples: FS FF-N-105.
 3. Power Driven Fasteners: National Evaluation Report NER-272, for power driven nails, screws or staples used in all types of building construction, issued by ICC-ES to ISANTA.
 4. Wood Screws: ANSI B18.6.1.
 5. Lag Bolts: ANSI B18.2.1.

2.6 FIBERGLASS-MAT FACED, MOISTURE RESISTANT GYPSUM SHEATHING

- A. Available Manufacturers: The following performance specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding, but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this section. Equal products by other manufacturers will be considered subject to ten (10) day prior approval.
- B. Available manufacturers: The following manufacturer and product has been accorded preliminary approval:

Georgia-Pacific Gypsum LLC: Fiberglass-Mat Faced Gypsum Sheathing **DENSGLOSS GOLD**.

- C. Manufacturers wishing to bid must submit the following to the Architect no less than ten (10) days prior to the bid date:

1. Manufacturer's Product Data.
2. Certified test reports showing conformance with requirements as specified.
3. Approval shall be by written addendum only. Verbal approval will not be given.

- D. Materials: Fiberglass-Mat Faced Gypsum Sheathing (ASTM C1177):

1. Thickness: 1/2 inch.
2. Width: 4 feet.
3. Length: 8 feet.
4. Weight: 1,900 pounds per M square feet.
5. Edges: Square.
6. Surfacing: Coated fiberglass mat on face, back, and long edges.
7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 540 PSF, dry.
8. Flexural Strength, Parallel (ASTM C472): 80 lbf, parallel.
9. Humidified Deflection (ASTM C1177): Not more than 1/4 inch.
10. Permeance (ASTM E96): 23 perms.
11. R-Value (ASTM C518): 0.56.

- E. Accessories:

1. Screws: ASTM C1002, corrosion-resistant treated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions / Inspection: Verify that project conditions and substrates are acceptable to the installer, prior to beginning work of this section.
- B. Examine walls and support framing in areas to receive wood decking and gypsum sheathing, for compliance with installation tolerances and other conditions affecting performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Install additional fasteners as required to comply with project wind uplift requirements.

3.2 INSTALLATION

- A. Install laminated wood sheathing as required to comply with the APA "Engineered Wood Construction Guide".
 1. Install wood sheathing with long joints in a continuous straight line with end joints staggered between rows a minimum of 24 inches, 48 inches where possible. Provide metal "H" clips at all unsupported edges, creating 1/8 inch spacing at all edge and end joints.

- B. Attach all plywood to substrate framing. Anchor with specified fasteners to resist building code wind loading requirements unless a more stringent fastening rate is specified.
 - 1. Fasten plywood at 6" centers into each support.
- C. Examine support framing in areas to receive wood sheathing, for compliance with installation tolerances and other conditions affecting performance of wood sheathing.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Provide pressure-preservative-treated plywood of indicated thicknesses.
 - 1. Provide elastomeric underlayment where pressure treated lumber will be in contact with sheet steel components; steel deck, sheet metal flashings, bent angle plates, etc. unless an alternate method of separation is indicated or specified in other specification divisions of this Project Manual.
- E. Gypsum Sheathing: Install in strict accordance with ASTM C1280 and with manufacturer's written recommendations.
 - 1. Install per the current product catalog of Georgia-Pacific Gypsum, or equal.

3.3 ADJUSTING

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged decking and sheathing if repairs are not approved by Architect.

3.4 PROTECTION

- A. Provide temporary waterproof covering as the Work progresses to protect roof decking and gypsum sheathing until roofing and other covering materials are applied.
- B. Coordinate with requirements for underlayment in Division 7 Roofing Sections.

END OF SECTION 06160

SECTION 06605 – FIBERGLASS REINFORCED PLASTIC PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification Sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Types of fiberglass reinforced plastic (FRP) panels included in this section are:
 - 1. Fiberglass reinforced polyester panel system for adhesive mounting over gypsum board substrate at the following rooms only:
 - (a) Kitchen 128
 - 2. Moldings, adhesive, and joint sealants related to FRP Panel System.

1.03 RELATED SECTIONS

- A. Division 9 Section "Gypsum Drywall", for drywall substrates.

1.04 REFERENCES

- A. ANSI/AHA A135.5 – Pre-finished Hardboard Paneling; 1995.
- B. ASTM D 256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 1997.
- C. ASTM D 523 - Standard Test Method for Specular Gloss; 1989 (Re-approved 1994).
- D. ASTM D 570 - Standard Test Method for Water Absorption of Plastics; 1998.
- E. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics; 1997.
- F. ASTM D 696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between - 30 degrees C and 30 degrees C with a Vitreous Silica Dilatometer; 1998.
- G. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 1997.
- H. ASTM D 792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement; 1998.
- I. ASTM D 968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive; 1993.
- J. ASTM D 1037 - Standard Test methods for Evaluating Properties of Wood-Base Fiber and Particle Panel materials; 1996a.
- K. ASTM D 1308 - Standard Test Method for Effect of Household Chemicals on Clear and

Pigmented Organic Finishes; 1987 (Re-approved 1998).

- L. ASTM D 2197 - Standard Test Methods for Adhesion of Organic Coatings by Scrape Adhesion; 1998.
- M. ASTM D 2486 - Standard Test Method for Scrub Resistance of Wall Paints; 1996.
- N. ASTM D 2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by means of a Barcol Impressor; 1995.
- O. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1998.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - (1) Preparation instructions and recommendations.
 - (2) Storage and handling requirements and recommendations.
 - (3) Installation methods.
- C. Selection Samples: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Maintenance Instructions: Deliver to Owner.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials in accordance with requirements of local authorities having jurisdiction.

1.07 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.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The following performance specification is intended to meet specific design, maintenance, and functional requirements necessary to this project. It is not intended to limit competitive bidding, but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part II of this specification. Equal products by other manufacturers will be acceptable subject to compliance with these specifications.
- B. The following manufacturer has been accorded prior approval. Other manufacturers desiring to obtain prior approval must submit for approval as outlined in Part 2.01 C. Marlite; 202 Harger Street, Dover, OH 44622. ASD. Tel: (330) 343-6621. Fax: (330) 343-

7296. www.marlite.com.

- C. Other manufacturers wishing to bid must submit to the Architect as follows in accordance with the Prior Approval Section of these specifications:
- (1) Applicable product data and product sample, including trim accessories.
 - (2) Certified test reports prepared by an independent testing laboratory showing conformance with requirements as specified.
 - (3) A list of projects similar in scope with a satisfactory track record of not less than five (5) years. List shall include project name, contractor, architect, and location.
 - (4) Stated differences between the proposed product and the specified.
 - (5) Approval of submittals shall be by written addendum only. Verbal approval **will not** be given.

2.02 APPLICATIONS

- A. Provide full-height plastic wall paneling over gypsum board substrate at gypsum board walls, equal to "Marlite FRP" with pebble surface at locations indicated at 1.02 above.
- B. Provide color-matching molding trim for each panel type.
- C. Color: As selected by Architect from manufacturer's standard colors. One color will be selected.

2.03 PANEL SYSTEM

- A. Plastic Panel System: Factory finished panels, trim, sealant, and accessories.
- B. Panels: **Equal to Marlite FRP Panels**; fiberglass reinforced polyester, USDA approved for incidental food contact.
- (1) Thickness: 3/32 inch (2.4 mm), nominal.
 - (2) Width: 48 inches (1220 mm).
 - (3) Height: 96 inches (2438 mm).
 - (4) Height: 108 inches (2743 mm).
 - (5) Height: 120 inches (3048 mm).
 - (6) Surface Burning Characteristics: Flame spread index of 200 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84 (Class C/III).
 - (7) Flexural Strength: 17,000 psi (117 Mpa), when tested in accordance with ASTM D 790.
 - (8) Flexural Modulus: 600,000 psi (4137MPa), when tested in accordance with ASTM D 790.
 - (9) Tensile Strength: 8,000 psi (55 Mpa), when tested in accordance with ASTM D 638.
 - (10) Tensile Modulus: 9,430 psi (65 Mpa), when tested in accordance with ASTM D 638.
 - (11) Barcol Hardness: 40, when tested in accordance with ASTM D 2583.
 - (12) Impact Resistance: 7 ft-lb/in (1225 N/m), when tested in accordance with ASTM D 256, Izod method.
 - (13) Coefficient of Thermal Expansion: 0.0000157 in/in/degree F (0.0000283 mm/mm/degree C), measured in accordance with ASTM D 696.
 - (14) Water Absorption: 0.17 percent, when tested in accordance with ASTM D 570.
 - (15) Specific Gravity: 1.53, when tested in accordance with ASTM D792.

- (16) Surface Texture: Gently pebbled, high-gloss.
- C. Panel Trim: Extruded PVC in manufacturer=s standard colors.
 - (1) Outside corners, inside corners, edge trim, and division molding.
 - (2) Base Molding: Design that simplifies installation and helps seal wall panel system, with factory made corners and splices.
- D. Sealant: Equal to Marlite Silicone Sealant; gun grade silicone rubber.
 - (1) Color: As selected by Architect from manufacturer=s standard colors.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Take panels out of cartons and allow for product acclimatizing to room conditions for at least 48 hours prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Clean surfaces thoroughly prior to installation.
- D. Protect adjacent surfaces from damage due to installation.

3.03 INSTALLATION

- A. Install in accordance with manufacturer=s instructions.
- B. Use the adhesives recommended by the panel manufacturer unless prohibited by local regulations; obtain manufacturer=s approval of alternative adhesives.
- C. Install continuous bead of silicone sealant in each joint and trim groove and between trim and adjacent construction, maintaining 1/8 inch (3 mm) expansion space.
- D. Avoid contamination of panel faces with adhesives, solvents, or cleaners; clean as necessary and replace if not possible to repair to original condition.
- E. Protect installed products until completion of project.
- F. Touch-up, repair or replace damaged products after Substantial Completion.

END OF SECTION 06605

SECTION 06650 - SOLID POLYMER FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specifications sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of solid polymer fabrications is indicated on Drawings and as follows:
 - (1) Countertops, Counter Facings and Edges at locations indicated. See Interior Elevations and Details.
- B. Related Work specified elsewhere:
 - (1) Division 6 Section "Rough Carpentry" for plywood backing at solid polymer surfaces.
 - (2) Division 6 Section "Finish Carpentry".
 - (3) Division 12 Section 12304 "Modular Laminate Casework".

1.03 REFERENCES

- A. Applicable Standards: Standards of the following, as referenced herein:
 - (1) American National Standards Institute (ANSI)
 - (2) American Society for Testing and Materials (ASTM)
 - (3) National Electrical Manufacturer's Associations (NEMA)
 - (4) Federal Specifications (FS)

1.04 SUBMITTALS

- A. Shop drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
- B. Samples: Submit minimum 2"x 2" (50mm x 50mm) samples. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work.
- C. Product data: Indicate product description, fabrication information and compliance with specified performance requirements.
- D. Maintenance data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.

1.05 QUALITY ASSURANCE

- A. Allowable tolerances:
 - (1) Variation in component size: (3mm).
 - (2) Location of openings: (3mm) from indicated location.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation. Store components indoors prior to installation.
- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.07 WARRANTY

- A. Provide manufacturer's 10-year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. For purpose of determining minimum performance and quality standards, this specification is based upon **Formica "Everform" Solid Surfacing™** solid polymer fabrications as manufactured by Formica Corporation.
- B. Equal products by Dupont (Corian), WilsonArt International, Nevamar, Samsung (Staron), will be accepted.
- C. Equal products of other manufacturers not named above will be considered, subject to submission in accordance with the "Prior Approval" section of these specifications.

2.02 MATERIALS

- A. Homogenous filled acrylic; not coated, laminated or of composite construction; meeting ANSI Z124.3 & 6, Type Six, and Fed. Spec. WW-P-541E/GEN.
 - (1) Flame Spread: Less than 25
 - (2) Smoke Developed: Less than 25
 - (3) Superficial damage to a depth of 0.010" (.25mm) shall be repairable by sanding and polishing.
- B. Thickness: ½", as indicated on Drawings.
- C. Pattern and Color: Equal to **Formica Solid Surfacing, Classic Series; #654 "Botanical Mosaic"**. Pattern and color selection are intended to establish a price range for solid polymer fabrications. The Architect reserves the right to select other standard patterns and colors within the established price range.

2.03 ACCESSORY PRODUCTS

- A. Joint adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints, with a chemical bond. (Technical Bulletin: CTDC 102).
- B. Sealant: Manufacturer's standard mildew-resistant, FDA/UL recognized silicone sealant in color matching or clear formulations. (Technical Bulletin: 102, 127).

2.04 FABRICATION

- A. Fabrication shall be performed by a company certified by the manufacturers.
- B. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's requirements.
- C. Form joints between components using manufacturer=s standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 2" (50mm) wide reinforcing strip under each joint.
- D. Rout and finish component edges to a smooth, uniform finish as detailed. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.
- E. Finish: All surfaces shall have uniform finish.
 - (1) Matte, with a gloss rating of 5-20.

PART 3 - EXECUTION

3.01 JOB MOCK-UP

- A. Prior to final approval of shop drawings, erect one full size mock-up of each component at project site for Architect review. Should mock-up not be approved, rework or remake until approval is secured. Remove rejected units from project site.
- B. Approved mock-ups may remain as part of finished work.

3.02 INSTALLATION

- A. Install components plumb and level, in accordance with approved shop drawings and product installation details.
 - (1) Edge Treatment: Ease edges as indicated on Drawings.
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
- C. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Components shall be clean on Date of Substantial Completion.
- D. Protect surfaces form damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired to Architect's satisfaction.
- E. Provide manufacturer's care and maintenance recommendations to Architect at project close out. Review same with Owner's maintenance personnel.

END OF SECTION 06650

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part-1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect Work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of insulation work is shown on drawings and indicated by provisions of this section.
- B. Applications of insulation specified in this section include the following:
 - (1) Unfaced Blanket-type Building Insulation as indicated on Drawings at the following locations:
 - (a) Exterior metal stud framing at locations shown on Wall Sections.
 - (c) Attic Insulation at bottom chord of roof trusses and at standing seam metal roof at radiused beam over Lobby 100 as shown on Sections.
- C. Weather Barrier Membranes over gypsum sheathing are specified in Division 7 Section 07250 "Weather Barriers."
- D. Rigid Roofing Insulation Board is specified in the Division 7 section in which other roofing products are covered.
- E. Rigid Insulation as part of Exterior Insulation and Finish System (E.I.F.S.) is specified in Division 7 Section 07240 "Exterior Insulation & Finish System."
- F. Un-faced Sound Attenuation Blankets are specified in Division 9, Section 09250 "Gypsum Board."
- G. Plumbing and HVAC insulation is specified in Division 15 sections.

1.03 QUALITY ASSURANCE

- A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by R-values they represent the rate of heat flow through a homogenous material exactly 1" thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.
- B. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

- (1) Surface Burning Characteristics: ASTM E 84

- (2) Fire Resistance Ratings: ASTM E 119
- (3) Combustion Characteristics: ASTM E 136
- (4) All insulation materials shall be asbestos free.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature and installation instructions for each type of insulation material required.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

- (1) Manufacturers of Glass Fiber Insulation:
 - (a) CertainTeed Corp.
 - (b) Johns Manville, Inc.
 - (c) Owens-Corning Fiberglass Corp.

2.02 INSULATING MATERIALS

- A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.
 - (1) Insulation shall be in thicknesses and R-values as indicated herein or on Drawings.
- B. Unfaced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with **ASTM C 665** for **Type I** (blankets without membrane facing); and as follows:
 - (1) Mineral Fiber Type: Fibers manufactured from glass.
 - (2) Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively, when tested in accordance with ASTM E 84.
 - (3) Thermal Resistance (R) 11; per ASTM C518 for 2-1/2" thick blankets, at exterior wall structural steel beams, as indicated on Drawings.
 - (4) Thermal Resistance (R) 19; per ASTM C518 for nominal six inch (6") thick blankets, at typical exterior 6" steel stud wall framing, as indicated on Drawings.
 - (5) Thermal Resistance (R) 30; per ASTM C528 for 9-1/2" thick blankets, at bottom chord of trusses and at rafter beam in Lobby 100, as indicated on Drawings.

- (7) Locations: Where indicated on Drawings.

2.03 AUXILIARY INSULATING MATERIALS

- A. Types recommended by insulation manufacturer, including insulation supports, clips, fasteners and other accessories.
- B. Attic insulation to be suspended on wire mesh at bottom chord of trusses or wire mesh on hanger wires as indicated on the drawings.

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

- A. Require Installer to examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate and related work is specified. Obtain Installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.
- B. Clean Substrates of substances harmful to insulations.

3.02 INSTALLATION, GENERAL

- A. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.
- C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.03 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Do not obstruct ventilation spaces, except for fire-stopping.
- C. Stuff loose glass fiber insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40% of normal maximum volume (to a density of approximately 2.5 lbs. per cu. ft.).

3.04 CLEAN-UP

- A. Remove and dispose of excess insulation, wrappings and other waste materials.

3.05 PROTECTION

- A. General: Protect installed insulation from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or where that is not possible, by temporary covering or enclosure.

END OF SECTION 07210

SECTION 07240 - EXTERIOR INSULATION AND FINISH SYSTEM

PART I - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

- A. Extent of exterior insulation and finish systems (E.I.F.S.) is indicated on drawings.
- B. Types of Exterior Insulation and Finish System applications in this section include the following:
 - (1) Applications over gypsum sheathing at exterior wall metal stud framing where indicated on the drawings
 - (2) E.I.F.S. Accessories
- C. Metal Stud Framing is specified in Division 5, Section 05400 "Cold-Formed Metal Framing."
- D. Gypsum Sheathing is specified in Division 6, Section 06160 "Sheathing".
- E. Sealing joints is specified in Division 7, Section 07920 "Joint Sealants".

1.03 DEFINITIONS

- A. Exterior insulation and finish system refers to an exterior assembly composed of an inner layer of thermal insulation board and an outer layer forming the protective finish coating. The assembly is applied to a supporting substrate of construction indicated. Designations below for the class and type of exterior insulation and finish system specified in this section are based on those developed by the Exterior Insulation Manufacturers Association (EIMA).
 - (1) Class PB Type A designates a polymer-based protective finish coating (Class PB), externally reinforced (Type A).
 - (2) System shall have mildew-resistant coating.
- B. System in this section refers to Class PB Type A exterior insulation and finish systems.
- C. System manufacturer refers to the manufacturer of the exterior insulation and finish system.

1.04 SYSTEM DESCRIPTION

- A. Provide system complying with the following performance requirements:
 - (1) Bond Integrity: Free from bond failure within system components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.

- (2) System shall have been tested at full scale for impact resistance and structural load capacity per ASTM E72 and E330 respectively.
 - (3) Weather-tightness: Resistant to water penetration from exterior into system and assemblies behind it or through them into interior of building which results in deterioration of thermal-insulating effectiveness or other degradation of system and assemblies behind system including substrates, supporting wall construction, and interior finish.
 - (a) System shall have been tested for moisture resistance, rain resistance, absorption-freeze, accelerated weathering, mildew resistance, salt spray resistance, chemical resistance, and abrasion resistance.
- B. Basis for Design (See Paragraph 2.01A, Page 5): **Dryvit Outsulation Plus MD System** is an Exterior Insulation and Finish System (EIFS), Class PB consisting of a secondary weather resistive barrier (Dryvit Backstop), adhesive (Dryvit Primus, Genesis, or Genesis DM) Dryvit reinforcing mesh, and Dryvit finish.
- (1) Design requirements:
 - (a) Acceptable Substrates shall include:
 - (1) Silicone treated gypsum core sheathing surfaced with inorganic fiberglass mats meeting ASTM C1177.
 - (2) Unglazed brick, cement plaster, concrete or concrete masonry.
 - (b) Deflection of the substrate systems shall not exceed 1/240 times the span.
 - (c) The substrate shall be flat within 6.4 mm (1/4" in a 1.2 m (4') radius.
 - (2) Performance requirements:
 - (a) **The Outsulation Plus MD System** shall have been tested for durability as follows:
 - (1) Abrasion Resistance: ASTM D968; no deleterious effects after 500 liters (132 gal).
 - (2) Absorption, Freeze-thaw: 60 cycles, slak at 20 deg. C (68 deg. F) for four days, then -10 deg. C (14 deg. F) for two hours, then 20 deg. C (68 deg. F) for two hours; no checking, cracking, or splitting.
 - (3) Accelerated Weathering: ASTM G23 (Federal Test Standard 141A Method 6151); 2000 hours. No deterioration.
 - (4) Mildew Resistance: Mil Standard 810B; passes.
 - (5) Moisture Resistance: ASTM D2247 (Federal Test Standard 141A Method 6201); no deleterious effects after 14 days.
 - (6) Salt Spray Resistance: ASTM B117 Federal Test Standard 141A Method 6061; 5% concentration for 300 hours. No deleterious effects.
 - (7) Air leakage: ASTM E283; less than 0.301 l/min/m² (.001 cfm/ft²) classified as a Type III air barrier as defined by the National Research Council of Canada.
 - (8) Water Penetration: ASTM E331; no water penetration to the inner most surface of the test specimen.
 - (9) Drainage: ASTM E331; 97% drainage efficiency.
 - (10) Water Vapor Transmission: ASTM E96 Procedure B; Standard lamina: 10 g/hr.m² (14 gr/hr.ft²).
 - (b) **The Outsulation Plus MD System** shall have been tested for structural performance as follows:

- (1) Tensile Bond Strength: ASTM C297.
 - (a) Backstop to exterior grade gypsum sheathing: 62.7 kPa (9.1 psi) sheathing facer failure.
 - (b) Backstop to Dens-Glass Gold: 199 kPa (28.8 psi) sheathing facer failure.
 - (c) Backstop to concrete/concrete block: 290 kPa (42.07 psi) substrate failure.
 - (d) Primus to Backstop: Minimum 86.9 kPa (12.6 psi).
 - (e) Genesis to Backstop: Minimum 104 kPa (15.1 psi).
- (2) Full Scale Structural Tests: ASTM E330; minimum failure load under positive or negative load of 4.3 kPa (90 psf) unless otherwise specified; substrate failure.
- (3) Impact Resistance: In accordance with EIMA Standard 101.86. Refer to table below: Panzer mesh used in conjunction with Standard mesh is recommended for areas exposed to high traffic.

Reinforcing Mesh/Weight g/m ² (oz/yd ²)	EIMA Impact Classification	EIMA Impact Range Joules (In-lbs)	Impact Test Results Joules (In-lbs)
Standard™ - 146 (4.3)	Level 1	3-6 (25-49)	4 (36)
Standard Plus™ - 203 (6)	Level 2	6-10 (50-89)	6 (56)
Intermediate ^R - 407 (12)	Level 3	10-17 (90-150)	12 (108)
Panzer ^R 15* - 509 (15)	Level 4	>17 (>150)	18 (162)
Panzer 20* - 695 (20.5)	Level 4	>17 (>150)	40 (352)
Detail ^R Short Rolls - 146 (4.3)	n/a	n/a n/a	n/a n/a
Corner Mesh - 244 (7.2)	n/a	n/a n/a	n/a n/a

*Shall be used in conjunction with Standard Mesh

- (c) **The Outsulation Plus MD System** shall have been tested for fire performance as follows:
 - (1) Surface burning Characteristics: ASTM E84:
 - (a) The EPS insulation board shall have a Flame Spread index not exceeding 25 and a Smoke Developed index not exceeding 450.
 - (b) The adhesives and coatings shall have a Flame Spread index not exceeding 20 and a Smoke Developed index not exceeding 10.
 - (2) ASTM E108 (Modified) Full Scale Fire Test; passed.
 - (3) UBC 26-9 Intermediate Scale Multi-Story Test (ISMA); passed.
 - (4) Ignitability Characteristics: BOCA National Building Code Radiant Heat Exposure Test of Exterior Wall Assemblies; passed.

1.05 SUBMITTALS

- A. Product Data: Manufacturer's technical data for each component of exterior insulation and finish system.

- B. Samples for Initial Selection Purposes: Manufacturer=s standard color charts, trim accessory samples, and small scale samples indicating textural choices available.
 - (1) Submit sealant manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available.
 - (2) Color and Texture of new exterior insulation and finish system shall be selected from the manufacturer's standard palette of colors and textures.
 - (3) Samples for Verification Purposes: Samples, 2' square, for each finish, color and texture indicated; prepare samples using same tools and techniques intended for actual work.
 - (4) Obtain Architect's acceptance of samples before start of final work.
 - (5) Incorporate within each sample a typical control joint filled with sealant of color indicated or selected.
 - (6) Retain samples during construction for judging completed work.
- C. Installer certificates signed by manufacturer certifying that Installers comply with specified requirements.
- D. Test reports for system from a qualified independent testing laboratory certifying and interpreting test results relative to system=s compliance with requirements for fire performance characteristics, bond integrity and material properties.
- E. Sealant compatibility and test report from sealant manufacturer certifying that materials forming joint substrates of system have been tested for compatibility and adhesion with joint sealant; include sealant manufacturer=s interpretation of results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- F. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction which evidence system=s compliance with building code in effect for project.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm regularly engaged in manufacturing products for system indicated and with at least 5 years successful experience in applications similar to that required for this Project.
- B. Installer Qualifications: Engage an Installer that is certified in writing by system manufacturer as qualified for installation of systems indicated.
- C. Single Source Responsibility: Obtain materials for system from either a single manufacturer or from manufacturers approved by the system manufacturer as compatible with other system components.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in original, unopened packages with manufacturer's labels identifying products legible and intact.

- B. Store materials inside and under cover; keep them dry, protected from the weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, damage from construction traffic and other causes.
- C. Stack insulation board flat and off the ground.

1.08 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install system when ambient outdoor temperatures are 40EF and falling unless temporary protection and heat is provided to maintain ambient temperature above 40E during installation of wet materials and for 24 hours after installation or longer to allow them to become thoroughly dry and weather resistant.

1.09 SEQUENCING AND SCHEDULING

- A. Sequence installation of system with related work specified in other sections to ensure that wall assemblies, including flashing, trim and joint sealers, are protect against damage from weather, aging, corrosion, or other causes.

1.10 WARRANTY

- A. **Provide a five (5) years minimum limited warranty for materials and workmanship.**

PART 2 - MATERIALS

2.01 MANUFACTURERS

- A. The following performance specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this section. Equal products by other manufacturers will be considered subject to submission in accordance with the Prior Approval section of these specifications.

DRYVIT Systems, Inc. - **Outsulation Plus MD** System (Basis of Design)

- B. Other pre-approved system and manufacturer:

Finestone Pebbletex Class PB (Type A) Wall System manufactured by Master Builders Solutions.

2.02 MATERIALS

- A. Compatibility: Provide adhesive, mechanical fasteners, board insulation, reinforcing fabrics, base and finish coat materials, and trim accessories which are compatible with one another and approved for use by system manufacturer.
- B. Provide colors and texture of protective coating to comply with following requirements:
 - (1) Provide selection made by Architect from manufacturer's full range of standard colors and textures available for type of finish coat indicated.

- C. Surface-Sealer: System manufacturer's standard adhesion intermediary designed to improve bond between substrate of type indicated and adhesive for application of insulation.
- D. Molded Polystyrene Board Insulation: Rigid, cellular thermal insulation formed by the expansion of polystyrene resin beads or granules in a closed mold to comply with F.S. HH-1-524C ASTM C578 for Type I; nominal 1.0 PCF density; aged in block form prior to cutting and shipping by air drying for not less than 6 weeks or by another method approved by system manufacturer and producing equivalent results; 2' x 4' x thicknesses indicated on Drawings, but not less than the minimum thickness allowed by system manufacturer for corner squareness and other dimensional tolerances.
- E. Reinforcing Fabric: Balanced, alkali-resistant open weave glass fiber fabric treated for compatibility with other system materials; made from continuous multi-end strands with tensile strength of not less than 120 lbs and 140 lbs. in warp and fill directions, respectively, per ASTM D1682 and complying with ASTM D578 and the following requirements:
 - (1) Weight of Standard Reinforcing Fabric: Not less than 3.75 oz. per sq. yd.
- F. Air/Weather Barrier: Shall provide an air and secondary weather barrier for the substrates listed in Section 1.02B (1), and include the following components:
 - (1) Dryvit Backstop: A 100% acrylic product, which is field mixed with Portland cement in a 1:1 ratio by weight.
 - (2) Dryvit Grid Tape™: An open weave fiberglass mesh tape with pressure sensitive adhesive.
 - (3) Dryvit Flashing Tape™: A high density, polyethylene backed, tape with a rubberized asphalt adhesive.
 - (4) Dryvit Flashing Tape Surface Conditioner™: A water-based surface conditioner and adhesion promoter for the Dryvit Flashing Tape.
- G. Dryvit AP Adhesive: A moisture cure urethane- based adhesive used to adhere the Dryvit Drainage Strip.
- H. Starter Trac (ST) and Starter Trac with Drip Edge (STDE): UV treated PVC "J" channels with weep holes manufactured by Plastic Components, Inc.
- I. Dryvit Drainage Strip: A corrugated plastic sheet material, which provides drainage.
- J. Adhesives/Base Coats: Use to adhere the insulation board to the air/weather barrier and to embed the reinforcing mesh on the face of the insulation board, shall be one of the following:
 - (1) Genesis: A fiber-reinforced, acrylic modified product, which is field mixed with Portland cement in a 1:1 ratio by weight.
 - (2) Genesis DM: A dry mix, polymer-based, fiber-reinforced product, which is field mixed with water.
 - (3) Primus: An acrylic polymer-based product, which is field mixed with Portland cement in a 1:1 ratio by weight.
 - (4) Dryvlex: A high percentage polymer-blend material which is field mixed with Portland cement in a 1:1 ratio by weight.
- K. Dryvit Finish: Shall be the type, color and texture as selected by the Architect, and shall be the following:

- (1) Medallion Series PMR: (Proven Mildew Resistance) Finishes: Water-based, acrylic finishes with integral color and texture:
- (2) Coatings, Primers and Sealers:
 - (a) As recommended by Manufacturer.

L. Water: Clean and potable.

M. Weep Tubes: Manufacturer's standard.

N. Accessories: Rigid Vinyl (Un-plasticized Polyvinyl Chloride – PVC); where recommended by the manufacturer; formulated for exterior use.

2.03 MIXING

- A. General: Comply with system manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as approved by system manufacturer. Mix materials in clean containers. Use materials within time period specified by system manufacturer or discard.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates to determine if they are in satisfactory condition for installation of system. Do not proceed with installation of system until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Protect contiguous work from moisture deterioration and soiling resulting from application of systems. Provide temporary covering and other protection needed to prevent spattering of exterior finish coatings on other work.
- B. Protect system, substrates, and wall construction behind them from inclement weather during installation. Prevent infiltration of moisture behind system and deterioration of substrates.
- C. Substrate Preparation: Prepare and clean substrates to comply with system manufacturer's requirements to obtain optimum bond between substrate and adhesive for insulation.
 - (1) Apply surface sealer over substrates, if required by system manufacturer for improving adhesion.

3.03 INSTALLATION

- A. General: Comply with system manufacturer's current published instructions for installation of system as applicable to each type of substrate indicated.
- B. Adhesively or mechanically attach insulation to comply with the following requirements:
 - (1) Allow attached insulation to remain undisturbed for period prescribed by system manufacturer but not less than 24 hours, prior to beginning rasping and sanding insulation or application of base coat and reinforcing fabric.

- C. Interlock ends at internal and external corners.
- D. Abut boards tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between insulation boards. If gaps occur, fill with insulation cut to fit gaps exactly; insert without use of adhesive.
- E. Rasp or sand flush any irregularities project more than 1/32" from surface of insulation; do not create depressions deeper than 1/16".
- F. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes conforming to details indicated.
- G. Interrupt insulation where expansion joints are indicated in substrates behind exterior insulation and finish systems.
 - (1) Provide "aesthetic" joints at E.I.F.S. walls and soffits, as shown and indicated on Drawings.
- H. Form joints for sealant application by leaving gaps of width needed between adjoining insulation edges as well as between insulation edges and dissimilar adjoining surfaces projecting through insulation that produce joint widths indicated after encapsulation of joint substrates with base coat, reinforcing fabric, and finish coat.
 - (1) Treat exposed edges of insulation board, including those forming substrates of sealed joints within system or between system and other work, by encapsulating with base coat, reinforcing fabric, and finish coat.
 - (2) Coordinate flashing installation with installation of insulation to produce a wall system which does not allow water to penetrate behind protective coating.
- I. Apply base coat to exposed surfaces of insulation in minimum thickness specified by system manufacturer.
- J. Fully embed reinforcing fabric of weight indicated below in wet base coat to produce wrinkle-free installation with fabric continuous at corners and lapped or otherwise treated at joints to comply with system manufacturer's requirements.
- K. Apply finish coat over dry base coat in thickness required by system manufacturer to produce a uniform finish of texture and color matching approved sample.

3.04 INSTALLATION OF JOINT SEALANTS

- A. Prepare joints to receive sealants, at locations indicated, to comply with applicable requirements of Division 7 section "Joint Sealants".

3.05 CLEANING AND PROTECTION

- A. Remove temporary covering and protection of other work. Promptly remove protective coatings from window and door frames, and any other surfaces outside areas indicated to receive protective coating.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer and system manufacturer, which ensures system being without damage or deterioration at time of substantial completion.

END OF SECTION 07240

SECTION 07250 – WEATHER BARRIERS

PART 1 – GENERAL

1.1 GENERAL

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.2 SECTION INCLUDES

- A. Weather barrier membrane
- B. Seam Tape
- C. Flashing
- D. Fasteners

1.3 REFERENCES

- A. ASTM International
 - 1. ASTM C920; Standard Specification for Elastomeric Joint Sealants
 - 2. ASTM C1193; Standard Guide for Use of Joint Sealants
 - 3. ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting
 - 4. ASTM D1117; Standard Guide for Evaluating Non-woven Fabrics
 - 5. ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
 - 6. ASTM E96; Test Method for Water Vapor Transmission of Materials
 - 7. ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls
 - 8. ASTM E2178; Test Method for Air Permeance of Building Materials
- B. AATCC – American Association of Textile Chemists and Colorists
 - 1. Test Method 127 Water Resistance: Hydrostatic Pressure Test
- C. TAPPI
 - 1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
 - 2. Test Method T-460; Air Resistance (Gurley Hill Method)

1.4 SUBMITTALS

- A. Refer to Section 01300 Submittals.
- B. Product Data: Submit manufacturer current technical literature for each component.
- C. Samples: Weather Barrier membrane, minimum 8-1/2 inches by 11 inch.
- D. Quality Assurance Submittals
 - 1. Manufacturer Instructions: Provide manufacturer's written installation instructions.

- E. Closeout Submittals: Refer to Division 1 Section "Project Closeout".

1.5 QUALITY ASSURANCE

- A. Qualifications
 - 1. Installation shall be in accordance with manufacturer's installation guidelines and recommendations.
 - 2. Source: Provide weather barrier & accessory materials produced by single manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store weather barrier materials as recommended by system manufacturer.

1.7 SCHEDULING

- A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. The following performance specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding, but rather encourage participation from all qualified which have the performance criteria as outlined in Part 2 of this section. Equal products by other manufacturers will be considered subject to ten (10) day prior approval.
- B. Available manufacturers: The following manufacturer and product has been accorded preliminary approval
 - (1) DuPont Building Innovations; 4417 Lancaster Pike, Chestnut Run Plaza 721, Wilmington, DE19805; 1-800-44-TYVEK (8-9835); <http://construction.TYVEK.com>.
 - (2) DuPont™ Tyvek® HomeWrap
- C. Manufacturers wishing to bid must submit the following to the Architect in accordance with the Prior Approval section of these specifications.
 - (1) Manufacturer's Product Data.
 - (2) Certified test reports prepared by an independent testing laboratory, showing conformance with the weather barrier requirements as specified.

- (3) Stated differences between the proposed window and units specified and shown on the Drawings.
- (4) Approval of submittals shall be by written addendum only. Verbal approval will not be given.

2.2 MATERIALS

- A. Basis of Design: spunbonded polyolefin, non-woven, non-perforated, weather barrier equal to DuPont™ Tyvek® HomeWrap® and related assembly components.
- B. Performance Characteristics:
 - 1. Air Penetration: 0.007 cfm/ft² at 75 Pa, when tested in accordance with ASTM E2178, Type I per ASTM E1677.
 - 2. Water Vapor Transmission: 58 perms, when tested in accordance with ASTM E96, Method B.
 - 3. Water Penetration Resistance: 210 cm when tested in accordance with AATCC Test Method 127.
 - 4. Basis Weight: 1.8 oz/yd², when tested in accordance with TAPPI Test Method T-410.
 - 5. Air Resistance: 300 seconds, when tested in accordance with TAPPI Test Method T-460.
 - 6. Tensile Strength: 30/30 lbs/in., when tested in accordance with ASTM D882, Method A.
 - 7. Tear Resistance: 6/6 lbs, when tested in accordance with ASTM D1117.
 - 8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 5, Smoke Developed: 20

2.3 ACCESSORIES

- A. Seam Tape: 2 inch wide, DuPont™ Tyvek® Tape as manufactured by DuPont Building Innovations.
- B. Fasteners:
 - 1. DuPont™ Tyvek® Wrap Caps, as manufactured by DuPont Building Innovations: #4 nails with large 1-inch plastic cap fasteners.
 - 2. Masonry tap-con fasteners with DuPont™ Tyvek® Wrap Caps as manufactured by DuPont Building Innovations: 2-inch diameter plastic cap fastener.

- C. Sealants
 - 1. Provide sealants that comply with ASTM C 920, elastomeric polymer sealant to maintain watertight conditions.
 - 2. Products: Sealants recommended by the weather barrier manufacturer.
- D. Adhesive:
 - 1. Provide adhesive recommended by weather barrier manufacturer.
- E. Primer:
 - 1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
- F. Flashing
 - 1. DuPont™ StraightFlash™, as manufactured by DuPont Building Innovations: straight flashing membrane materials for flashing sealing penetrations, at wall openings & penetrations, masonry ties, etc.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION – WEATHER BARRIER

- A. Install weather barrier over exterior face of all exterior wall sheathing substrates behind face brick, as shown on Drawings, in accordance with manufacturer recommendations.
- B. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.
- C. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface. Maintain weather barrier plumb and level.
- D. Extend bottom roll edge over masonry interface 2" to 3" minimum. Seal weather barrier with sealant or tape. Shingle weather barrier over back edge of thru-wall flashings and seal weather barrier with sealant or tape. Ensure weeps are not blocked.

- E. Subsequent layers shall overlap lower layers a minimum of 6 inches horizontally in a shingling manner.
- F. Wall Openings: Extend weather barrier completely over openings.
- G. Weather Barrier Attachment:
 - 1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, spaced 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.
- H. Apply 4 inch by 7-inch piece of DuPont™ StraightFlash™ to weather barrier membrane prior to the installation of cladding anchors.

3.3 SEAMING

- A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.
- B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 PROTECTION

- A. Protect installed weather barrier from damage.

END OF SECTION 07250

SECTION 073113 - ASPHALT SHINGLES

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. Asphalt shingles.
2. Underlayment.
3. Nail Over Ridge & Hip Vents.
4. Attic Intake and Exhaust Vent (Smart Vent)

B. Related Sections:

1. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, counter-flashings and flashings.

1.3 DEFINITION

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Samples for Initial Selection: For each type of asphalt shingle, ridge and hip cap shingles, ridge and eave vent indicated.

1. Include similar color charts of trim and accessories involving color selection.

- C. Samples for Verification: For the following products, of sizes indicated, to verify color selected:

1. Asphalt Shingle: Full size.
2. Ridge and Hip Cap Shingles: Full size.
3. Ridge Vent: 12-inch- (300-mm-) long Sample.
4. Attic intake vent: 12-inch- (300-mm-) long Sample.
5. Self-Adhering Underlayment: 12 inches (300 mm) square.
6. Synthetic Underlayment: 12 inches (300 mm) square.

- D. Qualification Data: For qualified Installer.

- E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.

- F. Research/Evaluation Reports: For each type of asphalt shingle required, from the ICC.
- G. Maintenance Data: For each type of asphalt shingle to include in maintenance manuals.
- H. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
 - 1. A single installer (Contractor) shall perform the roofing work of this project; and shall be a firm with not less than five (5) years experience in installation of Roofing System similar to that required for this project and which is acceptable to or licensed by manufacturer of primary roofing materials. Contractor/installer/sub-contractor is to have been in business under the same name and organization for the past five (5) consecutive years with a successful experience record.
 - 2. Installer's Field Supervision: Installer to maintain a full-time supervisor/foreman on the job site during times that roofing work is in progress. Any roofing installed during times when the supervisor/foreman is not on site is subject to rejection.
 - a. Provide Field Supervisor's resume.
 - b. Field Supervisor must be experienced in installation of roofing systems similar to type and scope required for this project.
- B. Manufacturer: Company specializing in Asphalt Roofing Products with fifteen (15) years minimum experience. Being listed as pre-qualified manufacturer does not release manufacturer from providing complete, current and acceptable test data for each performance, thermal, and wind load requirement specified.
 - 1. Shingle Roofing Standard: Comply with instruction and recommendations of shingle manufacturer, but not less than those recommended by ARMA's "Residential Asphalt Roofing Manual" and NRCA's "Steep Roofing Manual".
- C. Source Limitations: Obtain ridge and hip cap shingles ridge vents, felt underlayment and self-adhering sheet underlayment from single source from single manufacturer.
- D. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.
- E. Wind-Resistance Test Characteristics: Provide products identical to those tested according to ASTM D 3161 or UL 997 and passed. Identify each bundle of asphalt shingles with appropriate markings of applicable testing and inspecting agency.
- F. FM Listing: Provide shingle roofing system and component materials which have been evaluated by Factory Mutual System for fire spread, wind-uplift, and hail damage and are listed in "Factory Mutual Approval Guide" for Class 1 construction.

- G. Pre-installation Roofing Conference:** Prior to project start-up, a Pre-Roofing Conference will be held at the project site. Required attendees include the Owner, Architect/Consultant, Owner's insurer (if applicable), testing and inspection representative, roofing installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing including installer of roof accessories and equipment. **ATTENDANCE OF THE CONTRACTOR'S JOB SUPERINTENDENT IS MANDATORY.** Review methods and procedures related to roofing system including but not limited to the following:

1. Review methods and procedures related to asphalt shingle roof installation, including manufacturer's written instructions.
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 deck substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Review structural loading limitations of deck during and after roofing.
5. Review flashings, special roof details, roof drainage, roof penetrations, exhaust fans, venting requirements and condition of other construction that will affect roofing system.
6. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
7. Review temporary protection requirements for shingle assembly during and after installation.
8. Review roof observation and repair procedures after roofing installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated, weather-tight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.
1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.
- B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.
- C. Provide traps or other means of protection from weather. Manufacturer's plastic wrapping is provided for protection during shipping only.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install asphalt shingles until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

- B. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.
- C. Weather Conditions: Proceed with installation of shingles only with weather conditions are in compliance with manufacturer's recommendations and when substrate is dry.

1.8 WARRANTY

- A. The Warranties specified in this section 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. Warranty: Manufacturer's roof warranty for the replacement of asphalt shingles that fail in materials or workmanship within specified period.
 - 1. Failures include, but are not limited to, the following:
 - a. Manufacturing defects.
 - b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.
 - 2. Material Warranty Period:
 - a. Architectural Shingles: Thirty (30) years from date of Substantial Completion, prorated, with first five years non-prorated. Manufacturer's Ten (10) Year 110 mph wind warranty. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor Ten (10) years from date of Substantial Completion.
- C. **Special Warranty Language: State of Alabama Building Commission roofing systems manufacturer's warranty special requirements: Standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.**
- D. **Special Project Warranty:** General Contractor's State of Alabama Five (5) Year Roofing Guarantee covering the work of this Section. The Contractor is responsible for maintaining the roof in a water-tight condition, if leaks occur as a result of deterioration of materials or improper workmanship, for the following warranty period:
 - 1. **Warranty Period: Five (5) years from date of Substantial Completion.**

1.9 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Asphalt Shingles: 200 sq. ft of each type, in unbroken bundles.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Architectural Asphalt Shingles: ASTM D 3462, glass-fiber reinforced, mineral-granule surfaced, and self-sealing. UL Certification of ASTM D3462; Conforms to ASTM D3018 Type I – Self-Sealing; ASTM D3161-03b, Class "F" Wind Resistance (110-mph); ASTM D3161-99a, (110-mph) Wind Resistance; UL997 Wind Resistance, UL 2390/ASTM D6381 Class "H" and ASTM D7158 Class "H" Wind Resistance, and UL Class A Fire Resistance; heavy-duty glass fiber mat base; ceramically colored/UV resistant mineral surface granules across entire face of shingle; four-tab type, algae-resistant.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation – Landmark AR. (XT 30IR).
 - b. Owens Corning – TruDefinition Duration Storm. (Supreme Shingles).
 - c. GAF Materials Corporation – Timberline HD.
 2. Butt Edge Straight cut.
 3. Strip Size: Manufacturer's standard.
 4. Algae Resistance: Granules treated to resist algae discoloration.
 5. Color and Blends: As selected by Architect/Consultant from manufacturer's full range.

2.2 UNDERLAYMENT MATERIALS

- A. Self-Adhering Sheet Underlayment, Granular Surfaced: ASTM D 1970, minimum of 55-mil- (1.4-mm-) thick sheet; glass-fiber-mat-reinforced, SBS-modified asphalt; mineral-granule surfaced; with release paper backing; cold applied. This product shall be applied at all valleys, roof eave and rakes, hips and ridges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation – WinterGuard.
 - b. Owens Corning – WeatherLock Mat.
 - c. GAF Materials Corporation – StormGuard
- B. Synthetic Underlayment: Polyolefin based high strength reinforced roofing underlayment. ASTM D4869; Inorganic shingle underlayment standard ASTM D 6757. Fire resistance ASTM D 108, UL 790 Fire Resistant. UL classified as a Prepared Roofing Accessory. This product shall be applied over all plywood deck surfaces.
1. Manufacturers:
 - a. CertainTeed – DiamondDeck.
 - b. Owens Corning – Deck Defense.
 - c. GAF Materials Corporation – DeckArmor.

2.3 SHINGLE-OVER RIDGE/HIP VENTS

- A. Rigid Ridge/Hip Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with nonwoven geotextile filter strips and external deflector baffles; for use under ridge shingles.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Owens Corning – VentSure Rigid Roll Ridge Vent.
 - b. GAF Materials Corporation – Cobra Rigid Vent 2.
 - c. DCI Products, Smart Ridge II.
 2. Minimum Net Free Area: **18NFVA, per lineal foot.**
 3. Width: 11-inch Minimum.
 4. Thickness: 1-inch.
- B. Attic Intake Ventilation: Intake vent shall be SmartVent Attic Intake (SV-TAP) as manufactured by DCI Products, 425 South Penn Street, Clifton Heights, PA 19018. www.dciproducts.com or approved equal.
- C. Attic Off-peak and Roof-to-wall Exhaust Ventilation: Exhaust vent shall be SmartVent Attic Exhaust Vent (SV-TAP) as manufactured by DCI Products, 425 South Penn Street, Clifton Heights, PA 19018. www.dciproducts.com or approved equal.

2.4 MISCELLANEOUS MATERIALS

2.5 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free of consistency required by roofing system manufacturer for application.
- B. Roofing Nails: Double hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, **ring-shank**, sharp-pointed, with a minimum $\frac{3}{8}$ -inch- (9.5-mm-) diameter flat head and of sufficient length to penetrate $\frac{3}{4}$ -inch (19 mm) into solid wood decking or extend at least $\frac{1}{8}$ -inch (3 mm) through plywood sheathing.
1. Nails equal to the following:
 - a. Maze # R103A, 1.5-inches, 11 gauge, $\frac{3}{8}$ -inch head
 2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Underlayment Nails: Hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.
- D. Hip and Ridge Shingles: Pre-cut manufacturer's ridge and hip shingles applicable for wind warranty rating required under this Specification Section.
- E. Starter Shingles: Shall be located at the eaves and rakes or any other location where shingle roof begins. These shall be starter shingles as provided by the shingle manufacturer.

2.6 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim."

- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.
- C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16-inch (1.6 mm) thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 6-inches (150 mm) from pipe onto roof.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions under which shingle work is to be performed and notify Architect/Consultant in writing of unsatisfactory conditions.
- B. Do not proceed with shingle work until unsatisfactory conditions have been corrected.

3.2 PREPARATION OF SUBSTRATE

- A. Clean substrate of any projections and substances detrimental to shingle work. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with non-corrosive roofing nails.
 - 1. Remove and replace any damaged or deteriorated wood blocking, nailers, or fascia boards as drawings indicate.
- B. Verify that roof penetrations and plumbing stacks are in place and are securely fastened against movement.
- C. Verify roof openings are correctly framed prior to installing work of this Section.
- D. Verify deck surfaces are dry, free of ridges, warps, or voids.
- E. Review General and Specific Instructions noted on the Drawings.

3.3 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Single-Layer Synthetic Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2-inches (50 mm) over underlying course. Lap ends a minimum of 4-inches (100 mm). Stagger end laps between succeeding courses at least 72-inches (1830 mm). Fasten with capped roofing nails.
 - 1. Install synthetic underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of synthetic over self-adhering sheet underlayment not less than 3-inches (75 mm) in direction to shed water. Lap ends of felt not less than 6-inches (150 mm) over self-adhering sheet underlayment.
 - 2. Install fasteners at no more than 36-inch (900 mm) oc.

- C. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below and on Drawings, lapped in direction to shed water. Lap sides not less than 3-½inches (89 mm). Lap ends not less than 6-inches (150 mm) staggered 24-inches (600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.
1. Eaves: Extend from edges of eaves 12-inches (300 mm) beyond interior face of exterior wall.
 2. Rakes: Extend from edges of rake 12-inches (300 mm) beyond interior face of exterior wall.
 3. Valleys: Extend from lowest to highest point 18-inches (450 mm) on each side.
 4. Hips: Extend 18-inches (450 mm) on each side.
 5. Ridges: Extend 36-inches (914 mm) each side without obstructing continuous ridge vent slot.

3.4 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" and shingle manufacturer's written instruction.
1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Apron Flashings: Extend lower flange over and beyond each side of down-slope asphalt shingles and up the vertical surface.
- C. Step Flashings: Install with a head-lap of 2-inches (50 mm) and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.
1. First course minimum 5-inches by 12-inches applied with the lowermost edge of the first shingle.
 2. Succeeding courses must consist of pieces that are a minimum 5-inches by 10-inches. Place each piece of flashing 2-inches up the roof from where the lowermost edge of the next (overlapping) shingle will be applied. Each succeeding course of flashing must "overlap" the flashing course below it a minimum of 2-inches.
- D. Cricket Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.
- E. Closed-Valley Installation: Install valley shingle using closed-valley method; install in strict compliance with shingle roof system manufacturer's written specification guidelines.
- F. Rake Drip Edges: Install rake drip edge flashings **over** underlayment and fasten to roof deck.
- G. Eave Drip Edges: Install eave drip edge flashings **below** underlayment and fasten to roof sheathing.
- H. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

- I. Fabricate Pipe or Post Flashing: Assemble on-site as required with soldered seams and flange. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.5 ASPHALT SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
 1. **Shingles must be applied with exposure specified by the shingle manufacturer, this is a requirement. Changing exposure will harm the appearance of the installed roof and reduce the ability to resist wind up-lift.**
 2. **Extend asphalt shingles ¾-inch (19 mm) over fascia at eaves and rakes.**
 3. **Install manufacturer's starter strip along all eave and rake conditions.**
 4. **Install manufacturer's per-cut hip and ridge shingles at all hip and ridge conditions.**
- B. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- C. Fasten asphalt shingle strips with a minimum of **Six roofing nails** located according to manufacturer's written instructions. **Hand nailing only, pneumatically driven fasteners will not be allowed.**
- D. Closed-Cut Valleys: Extend asphalt shingle strips from one side of valley 12-inches (300 mm) beyond center of valley. Use one-piece shingle strips without joints in valley. Fasten with extra nail in upper end of shingle. Install asphalt shingle courses from other side of valley and cut back to a straight line 2-inches (50 mm) short of valley centerline. Trim upper concealed corners of cut-back shingle strips.
 1. Do not nail asphalt shingles within 6-inches (150 mm) of valley center.
 2. Set trimmed, concealed-corner asphalt shingles in a 3-inch- (75-mm-) wide bed of asphalt roofing cement.
- E. Ridge Vents: Install continuous ridge and hip vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- F. Off-peak and Roof-to-wall Vents: Install off-peak and roof-to-wall exhaust vents over and/or integrated with asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- G. Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
 1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

3.7 CLEANING AND PROTECTION

- A. Protect in-place roofing and installed products from foot traffic until completion of project.

- B. Any roof areas that are not completed by the end of the workday are to be protected from moisture and contaminants.
- C. Upon completion, remove any remaining debris from the roof and project site. Restore any damage to existing building surfaces and site caused by new work.

END OF SECTION 073113

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 steep-slope roof sheet metal fabrications.
 - 3. Formed roof penetration flashings.
 - 4. Formed metal fascia fabrications
 - 5. Prefinished metal soffit and trim at Arcade, Drive-thru Canopy, Recessed Entry and Soffits.

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 leak-proof, secure, and noncorrosive installation.

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".
 - 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.
 - 5. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 6. Document proceeding, 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 manufactured product and accessory.

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.
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, and counter-flashings as applicable.
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 1½-inches per 12-inches.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

D. 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.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. 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.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employ 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.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- C. 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 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 659-74.
 - c. Cracking, checking, peeling, or failure of paint to adhere to the bare substrate.
 - 2. **Finish Warranty Period: 20 years from date of Substantial Completion.**

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies 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" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.
- D. 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. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum-Zinc alloy-coated steel sheet (Galvalume); produced according to ASTM Specification A792/A792M-97a "Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by Hot-Dip Process." Structural quality, AZ50 or 0.50 oz/sq. ft. (150 g/sq. m.) architectural Galvalume. Colors shall consist of 70% PVDF Kynar/Hylar. Manufacturer shall offer colors that provide reflectivity and emissivity standards, in accordance with Energy Star Ratings, DOE and LEED criteria. Colors shall provide for an SRI rating of minimum 29 @ slopes of 2:12 or greater. All colors shall be identified as LEED qualified and "COOL" colors to meet Energy Star compliance, 24 gauge.
 - 1. Color: As selected by Architect/Consultant from manufacturer's full range.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed; with smooth, flat surface, 0.015-inch thickness or as indicated.
 - 1. Finish: 2D dull, cold rolled.

2.3 SELF-ADHERING UNDERLAYMENT SHEET

- A. General: A self-adhering underlayment sheet consisting of a white engineered polyolefin composite film with factory-applied anti-skid coating surface and rubberized asphalt membrane with split-release film.
 - 1. Material: WIP 300HT High-Temperature Protection Self-Adhering Roofing Underlayment by Carlisle.

2.4 POLYVINYL CHLORIDE UNDERLAYMENT SHEET

- A. A 20-mil polyvinyl chloride sheet meeting ASTM D-822.ELASTOMERIC UNDERLAYMENT/SEPARATION SHEET

2.5 MISCELLANEOUS MATERIALS

- A. General: 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 or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, 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 or manufactured item.
 - 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.
 - 2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 3. Fasteners for Zinc-Coated (Galvanized) Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless.
 - 4. Fasteners for attachment of wood nailers and blocking: Series 300 Stainless steel screws.
- C. Solder:
- 1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape ½-inch (13-mm) wide and ⅛-inch (3 mm) thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.6 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
- 1. 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.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. 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.
 - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of ¼-inch in 20-feet (6-mm in 6-m) on slope and location lines indicated on Drawings and within ⅛-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
- 1. Use lapped expansion joint unless otherwise shown.

2. Form expansion joints of intermeshing hooked flanges, not less than 1-inch (25-mm) deep, filled with butyl sealant concealed within joints as indicated on the drawings.
- D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices from galvanized steel as indicated minimum 20-gauge.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use, rivet joints where necessary for strength.
- G. Do not use graphite pencils to mark metal surfaces.

2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch (2400-mm) long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from 16 gauge galvanized steel. Fabricate expansion joints, expansion-joint covers and gutter accessories from same metal as gutters.
 1. Gutter Style: SMACNA designation for profile as shown on the drawings.
 2. Expansion Joints: Butt type with cover plate.
 3. Fabricate from the following materials:
 - a. Pre-Finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.
- B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
 1. Fabricated Hanger Style: SMACNA figure designation as "32B".
 2. Fabricate from the following materials:
 - a. Pre-Finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

2.8 ROOF SHEET METAL FABRICATIONS

- A. General: Any clarifications will be in accordance with National Roofing Contractors Association (NRCA) standards.
- B. Roof Edge Flashing: Fabricate in minimum 96-inch (2400mm) long, but not exceeding 12-foot (3.6-m) long sections.
 1. Joint style: Overlapped, 4-inches (100mm) wide.
 2. Fabricate from the following materials:
 - a. Pre-Finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge.
- C. Counter-flashing: Fabricate from the following materials:
 1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

- D. Expansion Joints: Fabricate from the following materials:
 - 1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.
- E. Rake Trim: Fabricate from the following materials:
 - 1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.
- F. Apron flashing: Fabricate from the following materials:
 - 1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.
- G. Step-flashing: Fabricate from the following materials:
 - 1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.
- H. Fascia/Frieze Cladding: Fabricate from the following materials:
 - 1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

2.9 PRE-FINISHED METAL SOFFIT SYSTEM

- A. 12" Full Ventilating Panel: Equal to Petersen, Pac-Clad, Pac-750 Soffit Panel; .032" thick aluminum; 1/2" panel depth, 6" o.c. "V" grooves.
- B. Trim Accessories: Pac-Clad Matching J-Channel Trim
- C. Finish: Kynar
- D. Color: As selected by Architect from manufacturer's full range of 36 stocked standard colors.
- E. Warranty: 30 yr. non-prorated finish warranty.

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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ELASTOMERIC UNDERLAYMENT/SEPARATION SHEET INSTALLATION

- A. Install underlayment as indicated on the drawings.

- B. Elastomeric Sheet Underlayment: Install underlayment, under sheet metal flashings and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2-inches.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Install continuous cleats spaced not more than 1-inch apart. Anchor each cleat with fasteners through the vertical leg face at 12-inches on center.
 - 4. Install exposed sheet metal flashing and trim without excessive oil canning, and free of buckling and tool marks.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
 - 6. 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. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet of polyvinyl chloride (PVC) underlayment.
 - 2. Bed flanges in approved sealant where required for waterproof performance.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10-feet with no joints allowed within 24-inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges not less than 1-inch deep, filled with elastomeric sealant concealed within the joints.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1¼-inches for wood screws
 - 1. Galvanized or Aluminum-Zinc Alloy-coated steel: Use stainless-steel fasteners
 - 2. Stainless Steel: Use stainless steel fasteners.
- 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. Embed hooked flanges of joint members not less than 1-inch (25-mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70° F (4 and 21° C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4° 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. Pre-tin edges of sheets with solder to width of 1½-inches (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder metallic-coated steel and aluminum sheet.
 2. Do not pre-tin zinc-tin alloy-coated stainless steel
 3. Do not use torches for soldering.
 4. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 5. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, NRCA's "Roofing and Waterproofing Manual" and "SMACNA's Manual.". Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Counter-flashing: Coordinate installation of counter-flashing with installation of base flashing. Insert counter-flashing in reglets or receivers and fit tightly to base flashing. Extend counter-flashing 4-inches (100-mm) over base flashing. Lap counter-flashing joints minimum of 4-inches (100-mm). Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant; interlocking folded seam or blind rivets and sealant as indicated.

3.5 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters: Join sections with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored straps spaced not more than 36 inches (900 mm) apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Loosely lock straps to front gutter bead and anchor to roof deck.
- C. Downspouts: Join sections with 1½-inch (38-mm) telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60-inches (1500 mm) o.c.
2. Provide elbows at base of downspout to direct water away from building.
3. Connect downspouts to underground drainage system as indicated.

3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited SMACNA sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of ¼-inch in 20-feet (6-mm in 6-m) on slope and location lines indicated on Drawings and within ⅛-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING AND PROTECTION

- 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.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. 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.

END OF SECTION 076200

SECTION 07920 – JOINT SEALANTSPART 1 - GENERAL1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification Sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

- A. Extent of joint sealer (denoted “sealant” or “caulking” on Drawings) is indicated on Drawings.
- B. This Section includes joint sealers for the following locations:
 - (1) Wall control joints “W.C.J.”
 - (2) Exterior and interior perimeters of all door frames, windows, louvers and other openings in interior and exterior walls.
 - (3) Top edge of roof counter flashings.
 - (4) Perimeter of all wall-hung plumbing fixtures.
 - (5) Below all exterior door thresholds.
 - (6) Around bottom of all exterior and interior hollow metal frames, at finish flooring termination against frame.
 - (7) All other locations as indicated or as required for providing watertight or aesthetic joints.
- D. Sealing joints related to Cast Stone is specified in a Division 4 Section 04720 “Architectural Cast Stone.” Cast Stone joint sealing shall be performed by Cast Stone Installer, using products and methods as specified in this section.
- E. Sealing joints at fire-rated construction is specified in Division 7 Section 07270 “Fire-stopping.”
- F. Sealing joints related to Roofing is specified in another Division 7 Section.
- G. Sealing joints related to Exterior Insulation and Finish System (E.I.F.S.) is specified in another Division 7 Section.
- H. Sealants for Glazing Purposes are specified in a Division 8 Section.
- I. Materials shall be delivered to the job site in new unbroken containers clearly labeled as to contents. Materials are to be stored at normal room temperature.
- J. Color cards of current available colors shall be submitted to Architect for selection of color.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Sealant shall be equal to Sonneborn "NP-1", 1-part polyurethane, U.S. Government Spec. TT-S-00230, Type II, Class A. (Exterior locations).
- B. Interior Non-Fire-Rated Locations: Sealant shall be equal to Tremco Acrylic Latex 834 or equal/Dow "Performance Plus" Silicone Sealant.

2.02 Joint backing shall be as recommended by sealant manufacturer.

PART 3 – EXECUTION

3.01 APPLICATION

- A. Examine all joints to determine their acceptability for caulking and report discrepancies to the General Contractor.
- B. Clean all joints of foreign matter or loose particles; use compressed air as necessary. Insure that surfaces are dry.
- C. Joints up to 2" wide shall be 1/4"-3/8" deep. Joints over 2" wide shall have depth required. Force in sealant to fill entire joint and tool smooth. Use solvent as recommended by the sealant manufacturer for tooling.
- D. At completion of joint sealers, clean off all excess material from adjoining surfaces. Correct any damage caused by this work and leave work in watertight and neat condition.

END OF SECTION 07920

SECTION 08110 – HOLLOW METAL DOORS & FRAMES

PART 1 - GENERAL

- 1.01 WORK under this section comprises of furnishing and installing hollow metal frames for doors, windows and hollow metal doors and panels.
- 1.02 RELATED DOCUMENTS, drawings and general provisions of contract, General and Supplementary Conditions and Division 1 specifications sections apply to this section.
- 1.03 RELATED WORK, specified elsewhere that should be examined for its effect upon this section.
 - A. Section 08 7100 Finish Hardware
 - B. Section 09910 Painting
 - C. Section 09250 Gypsum Drywall
 - D. Section 08210 Flush Wood Doors
 - E. Section 06100 R&F Carpentry
- 1.04 REFERENCES SPECIFIED in this section subject to compliance as directed:
 - A. ASTM-A366-95A - Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
 - B. ASTM-A568-95 -Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.
 - C. ASTM-A 569-91A - Specification for Steel, Carbon, (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.
 - D. ASTM-A924-95 - General Requirements for Steel Sheet, Metallic coated by the Hot-Dip Process.
 - E. ASTM-A620- Specifications for Steel, Sheet, Carbon, Drawing Quality, Special Killed, Cold Rolled (for embossed panels).
 - F. ANSI A250.8-1998/SDI100 - Recommended specifications for standard steel doors and frames.
 - G. SDI-105-92 - Recommended Erection Instructions for Steel Frames.
 - H. ANSI/SDI A250.6 - 1997 - Hardware on Steel Doors (reinforcement-application).
 - I. ANSI-A250.4-1994 Test Procedure and acceptance criteria for physical endurance, steel doors and frames.
 - J. ANSI-A224.1-1990 Test Procedure and acceptance criteria for prime painted steel surfaces for steel doors and frames.
 - K. ADA, The Americans with Disabilities Act - Title III - Public Accommodations

- L. ANSI-A117.1-1992 American National Standards Institute - Accessible and Usable Buildings and Facilities
- M. U.L. - 1784-90 Air leakage test of door assemblies.
- N. ASTM E283-91 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- O. IBC- 2021

1.05 SUBMITTALS

- A. Shop Drawings: Indicate door and frame elevations and sections, materials, gages and finishes, fabrication and erection details, locations of finish hardware by dimension and locations/details of all openings and louvers. Do not proceed with any fabrication until all details are approved.
- B. Certification of Compliance: Submit any information necessary to indicate compliance to these specifications.
- C. Submit samples as necessary.

1.06 QUALITY ASSURANCE

- A. Hollow metal supplier shall be a qualified direct distributor of products to be furnished. In addition the distributor shall have in their regular employment an A.H.C./C.D.C. or person of equivalent experience who will be available at reasonable times to consult with the Architect/Contractor and/or Owner regarding any matters affecting the total door and frame openings.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver doors and frames cardboard wrapped, crated, palletized or otherwise protected during transit and site storage.
- B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and accepted by the Architect. Otherwise remove and replace damaged items.
- C. Store doors and frames at the building site in a dry, secure place.
 - 1. Place units on minimum 4 inches (101.6) high wood blocking.
 - 2. Avoid use of non-vented plastic or canvas shelters which could create a humidity chamber.
 - 3. If cardboard wrapper/packaging on door becomes wet, remove packaging materials immediately.
 - 4. Provide 1/4 inch (6.3) spaces between stacked doors to promote air circulation.

1.08 SEQUENCING AND SCHEDULING

- A. Deliver all doors and frames to the jobsite in a timely manner so not to delay progress of other trades.

- B. Issue purchase orders to frame, door and other hardware suppliers early so not to interfere with normal quoted delivery of materials.

1.09 **WARRANTY**

- A. Hollow metal doors and frames shall be supplied with a one (1) year warranty against defects in materials and workmanship.
- B. Warranty to commence with Architect's determination of substantial completion of the job.

PART 2 - PRODUCTS

2.01 **ACCEPTABLE MANUFACTURERS** (providing the products supplied comply with this specification)

- A. STEELCRAFT
- B. CURRIES Co.
- C. CECO
- D. WINDSOR REPUBLIC

2.02 **MATERIALS**

- A. Steel requirements, all doors and frames to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel per ASTM-A-366 and A-568 general requirements or galvanealed to 'A-60' minimum coating weight standard per ASTM-A924. Internal reinforcing may be manufactured of hot rolled pickled and oiled steel per ASTM-A569.
- B. Coating Materials, primer, Use manufacturer's standard rust inhibiting primer conforming to ANSI-A-224.1-1990.
- C. Core Materials:
 - 1. Non-labeled doors or labeled doors, polystyrene foam core, self-extinguishing, non-toxic in case of fire.
 - 2. Fire labeled doors with temperature rise rating to have a mineral fiber core sufficient to obtain a 250 degree F (121 C) temperature rating.

2.03 **FABRICATION**

- A. General
 - 1. Fabricate all doors and frames in accordance with ANSI A250.8-1998/SDI-100 except where more stringent requirements are specified.
 - 2. Prepare doors to receive finish hardware per approved schedule. Include all thru-bolting holes as required per hardware template. not include unnecessary cutouts in door faces not required hardware template.
 - 3. Supply only doors and frames manufactured by one (1) of the acceptable manufacturers listed in this specification.
- B. Doors
 - 1. Classification: SDI Level 3 – Model 1.

2. Face Sheets: Minimum 16 ga. (0.053 inch) (1.3mm).
 - a. Cold or hot-rolled at interior locations.
 - b. Galvannealed A-60 at exterior locations.
3. All galvannealed doors at exterior locations to have galvannealed hardware reinforcements and channels.
4. Seams allowed only on edges of doors.
5. All vertical lock and hinge edges to be beveled 1/8 inch (3.2mm) in 2 inches (50.8mm). Non-beveled doors are not acceptable.
6. Doors to have continuous vertical mechanical interlocking joints at both lock and hinge edges with seams sealed internally by epoxy.
7. Top and bottom channels
 - a. Not less than 14 ga. (0.067 inch) (1.6mm) – inverted.
 - b. Weld channels securely to both face sheets. Gluing of face sheets to supporting door channels is not acceptable.
 - c. Close tops of outswinging exterior doors flush by the addition of steel top caps or channel fillers.
 - d. Bottom channel must be inverted. Provide weep holes in bottom channel to allow for escape of entrapped condensation moisture.
8. Closer reinforcements required in all doors scheduled for closers.
 - a. Reinforcements to be minimum 14 ga. (0.067 inch) (1.6mm).
 - b. Minimum of 20 inches (508mm) long.
 - c. Welded into door.
 - d. Galvannealed A-60 where door faces are specified as galvannealed.
9. Astragals: Where called for to be flat security type or “Z” as called for in drawings, specifications or by listing requirements.
10. All doors conform to ANSI-A250.4-1994 Level “A” criteria and be Tested to 1,000,000 operating cycles and 23 twist tests. Certification of Level “A” doors is to be submitted with approval drawings by the distributor. Do not bid or supply any type or gage door not having been tested and passed this criteria.

C. Frames

1. Construction: 16 ga. (0.053 inch) (1.3mm) hot or cold-rolled steel at interior locations, 14 ga. (0.067 inch) (1.6mm) galvannealed A-60 at exterior locations.
2. All galvannealed frames to have galvannealed hardware reinforcements only.
3. All exterior door frames are to be face welded, ground smooth, and shop or factory reprimed at the welded area. All interior door frames are to be face welded, ground smooth, and shop or factory reprimed at the welded area. KD type may be used where necessary to match existing and may be assembled at the jobsite. Fill all anchor point holes flush with adjacent surface, sand smooth and paint as specified.
4. Provide temporary shipping bars to help protect from damage during transmit and handling.
5. Temporary shipping bars to be removed before setting frames.
6. All welds on frames, transoms and sidelites to be flush with neatly mitered or butted material cutts.

D. Anchors

1. Wall anchors for attachment to masonry construction or drywall partitions
 - a. Use masonry, steel or wood stud anchors sized to accomodate frame jamb depth and face dimension on all welded frames.
2. All frame jamb anchors to be provided; one each jamb per 30 inches (762mm) of frame height or fraction thereof.
3. Floor anchors: Vertically adjustable

- a. Floor anchors to be screw adjustable prior to permanent installation so as to provide the ability to plumb frame without the use of shims under jambs.
 - b. Fabricate anchors to receive 2 fasteners per jamb.
 - 4. Head struts: For frames not anchored to masonry or concrete construction provide ceiling struts spot welded to jambs each side extending to building structure.
- E. Preparation For Hardware
- 1. Reinforcement: Reinforce components for hardware installation in accordance with SDI-107.
 - a. All lock and closer reinforcements in doors to be "box" or "channel" type.
 - b. All hinge reinforcements in doors to be 7 ga.
 - c. All hinge reinforcements in frames to be 7 ga. (0.167 inch) (4.2mm) securely welded to the frame rabbet.
 - 2. Punch single leaf frames to receive three (3) silencers. Double leaf frames to receive one silencer per leaf at head. Factory install silencers prior to shipment to job site.
 - 3. Factory prepared hardware locations to be in accordance with "Recommended locations for Builders' Hardware for Standard Steel Doors and Frames", as adopted by The Steel Door Institute.

PART 3 - EXECUTION

3.01 SETTING FRAMES

- A. Set all frames in accordance with SDI 105-92.
- B. Set welded frames in position prior to beginning partition work. Brace frames until permanent anchors are set.
- C. Set anchors for frames as work progresses. Install anchors at hinge and strike levels.
- D. Use temporary setting spreaders at all locations. Use intermediate spreaders to assure proper door clearances and header braces for grouted frames.
- E. Install all fire rated frames in accordance with requirements of NFPA-80-1999.
- F. Remove factory spreader bars used for shipping from frames before setting.

3.02 DOOR INSTALLATION

- A. Install hollow metal doors in frames using hardware specified in Section 08710 Finish Hardware.
- B. Clearances at edge of doors
 - 1. Between door and frame at head and jambs: 1/8 inch (3.2).
 - 2. At meeting edges pairs of doors and at mullions: 1/8 inch (3.2).

3. At transom panels, without transom bars: 1/8 inch (3.2).
4. At sills without thresholds: 5/8 inch (15.9) maximum above finish floor.
5. At sills with thresholds: 1/8 inch (3.2) above threshold.

3.03 ADJUSTMENT AND CLEANING

- A. Remove dirt and excess sealants, mortar or glazing compounds from exposed surfaces.
- B. Adjust moving parts for smooth operation. Use shims if necessary to allow for proper closing.
- C. Fill all dents, holes, etc. with metal filler and sand smooth and flush with adjacent surfaces - Reprime/paint to match finish.

END OF SECTION 08110

SECTION 08210 - WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pre-fit and pre-machine pre-finished wood doors with flush faces.

B. Related Sections:

1. Section 08110 - Hollow Metal Frames.
2. Section 08710 – Door Hardware.
3. Section 08800 - Glass and Glazing.

1.2 REFERENCES

- A. WDMA - Window and Door Manufacturers Association: IS 1-A 1997 Industry Standard for Architectural Flush Wood Doors.
- B. NFPA-80 Standards for Fire Doors 1999 Edition.
- C. 2016 International Building Code or UL10c, Positive Pressure Fire Door Test Method.
- D. NFPA-105 Recommended Practice for Installation of Smoke-Control Door Assemblies, latest edition

1.3 SUBMITTALS

A. Shop Drawings and Product Data:

1. Submit in accordance with Section 01300.
2. Indicate general construction, jointing methods, hardware and louver locations, and locations of cut-outs for glass. Indicate thickness of veneers.

B. Samples:

1. Submit samples of wood veneer and factory finishing in accordance with WDMA Quality Standards I.S. 1-A 1997, sections G-18 and Guide Specifications 1.03 C.

C. Certification:

1. Submit certification that doors and frames comply with IBC 2009 or UL10c, Positive Pressure Fire Door Test Method.

1.4 QUALITY ASSURANCE

- A. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies in accordance with IBC 2009 or UL10c, Positive Pressure Fire Door Test Method and which are labeled and listed for ratings indicated by ITS -

Warnock Hersey, UL or other testing and inspection agency acceptable to authorities having jurisdiction.

1. Doors: Comply with IBC-2016 or UL10c Category A.

B. WDMA I.S. 1-A 1997 Quality Standard: Window and Door Manufacturers Association Quality Standards for grade of door, core, construction, finish, and other requirements.

1.5 PRODUCT HANDLING

A. Plastic wrap and protect wood doors during transit, storage and handling to prevent damage, soiling or deterioration. Doors to be stored flat, off the floor with bottom door being supported every 24 inches in clean, dry surroundings. Protect from dirt, water and abuse.

B. Doors shall not be exposed to excessive moisture, heat, dryness, direct sunlight or where heating or air conditioning ducts will blow directly on them. Relative humidity should not be less than 30 % or greater than 60 %. Doors to be handled with clean or gloved hands so not to soil doors. Always keep doors in poly bag until they are ready to hang.

1.6 GUARANTEE/WARRANTY

A. **Guarantee:** Provide manufacturer's guarantee for all wood doors. Guarantee period: Lifetime of original installation. Doors exhibiting defects in materials or workmanship within guarantee period shall be replaced (including hanging and finishing) with new doors. These terms shall be part of the manufacturer's standard warranty.

PART 2 - PRODUCTS

2.0 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

OSHKOSH
EGGERS Industries
ALGOMA Hardwoods

2.1 MATERIALS

A. Door Construction:

1. Non-Fire Rated Doors: Thickness: 1-3/4 inches, interior flush wood, bonded, solid core conforming to WDMA I.S. 1-A 1997 and the following;

- a. Core: bonded particle core (PC) conforming to WDMA I.S. 1-A 1997.
- b. Door construction shall conform to WDMA I.S. 1-A 1997 Premium Grade requirements.
- c. Stiles: Hardwood to match face veneer over structural composite lumber (SCL), glued to core.
- d. Rails: Mill option hardwood or SCL. Top and bottom: 2 inches before trim or factory fit.
- e. Facing: Wood veneer cut and specie as specified shall conform to WDMA I.S. 1-A 1997 "A" grade for Premium Grade Door Construction requirements.

2. Fire Rated Doors: Thickness: 1-3/4 inches, interior flush wood, bonded, solid core conforming to WDMA I.S. 1-A 1997 and the following;
 - a. Core: bonded mineral core (FD) conforming to WDMA I.S. 1-A 1997.
 - b. Door construction shall conform to WDMA I.S. 1-A 1997 Premium Grade requirements.
 - c. Stiles: Hardwood to match face veneer over mineral composite, glued to core.
 - d. Rails: Mineral composite as required by fire door authorities. Top and bottom: as required by manufacturer's fire door authorities.
 - e. Facing: Wood veneer cut and specie as specified shall conform to WDMA I.S. 1-A 1997 "A" grade for Premium Grade Door Construction requirements.

B. WOOD VENEER

1. Door face veneers shall meet quality standards conforming to WDMA I.S. 1-A 1997 "A" grade for transparent or semi-transparent finish. Minimum face veneer thickness shall be 1/50" at 12% moisture content after finish sanding
2. Species: White Birch
3. Face Cut: Rotary Cut
4. Face Assembly: Book Match
5. Face Symmetry: Running Match

C. ADHESIVES

1. Adhesives: Face to core adhesives shall be Type I or Type II as appropriate for location in building. Adhesives must be classified Type I or Type II per WDMA TM-6 "Adhesive Bond Test Method." Type I adhesives shall be used for doors in exterior applications, Type II adhesives shall be used for doors in interior applications.

D. CORE

1. Non-rated doors: Solid particleboard.
2. Fire-rated doors: Non-combustible mineral core containing no asbestos.

2.2 FACTORY FINISHING

1. Comply with referenced WDMA Section G-15, "Factory Finishing" for Premium Grade factory finish systems.
2. Pre-finish wood doors at factory.
3. Architect shall select color from manufacturer's standard colors.
4. Transparent Finish: Match finish indicated in WDMA Section G-17: WDMA System #6.
5. Doors shall be poly-bagged.

2.3 ACCESSORIES

A. Vision Frames:

1. Non-rated doors: Prefinished wood vision frames to match door veneer and finish.
2. Fire-rated doors: Metal vision frames.
3. Glass: Refer to Glazing Section for glass types.

2.4 FABRICATION

- A. Fabricate wood doors in accordance with requirements of WDMA I.S. 1-A 1997 Quality Standards.
- B. Fabricate fire rated doors in accordance with requirements of ITS - Warnock Hersey or Underwriters' Laboratories, with metal label on each door including IBC 2009 or UL-10c.
- C. Fabricate doors with WDMA Quality Standards hardware blocking options as follows:
 - 1. Provide HB-1 - head and HB-2 - sill rails and HB-4 – lock block on all doors.
 - 2. Provide HB-6 only when exit devices are specified for door.
- D. Provide doors with minimum ¼ inch thick edge strips, of wood species to match face veneers except as required for fire rating.
- E. Make cut-outs and provide stops for glass and louvers. Seal cut-outs prior to installation of moldings.
- F. Bevel lock and hinge edges of single acting doors 3 degrees or 1/8 inch in 2 inches.
- G. Prepare doors to receive hardware. Refer to Section 08710 - Hardware, NFPA 80 Latest Edition and UL10c Positive Pressure Fire Door Test Method for hardware requirements.
 - 1. Pre-fit and bevel to net opening size less approximately 1/4 inch in width on single swing doors. Provide 1/4-inch clearance above finished floor, unless otherwise indicated on drawings. Provide 1/8-inch clearance at top of door.
 - 2. Slightly ease vertical edges.

PART 3 - EXECUTION

3.0 EXAMINATION

- A. Examine installed door frames before hanging doors.
- B. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.1 INSTALLATION

- A. Handle doors in accordance with recommendations of WDMA I.S. 1-A, "Care and Installation at Job Site."
- B. Condition doors to average temperature and humidity in area of installation for not less than 48 hours prior to installation. Store doors per recommendations of WDMA I.S. 1-A, "Care and Installation at Job Site."
- C. Install in neat and skillful manner, free from hammer or tool marks, open joints or slivers.
- D. Set plumb, level, square and true. Install work after building humidity is at acceptable level.

- E. Remove and replace all doors found to be warped, twisted, bowed, or otherwise damaged. Do not install doors which cannot be properly fitted to frames.
- F. Adjust prefinished doors and hardware and other moving or operating parts to function smoothly and correctly.
- G. Ensure that smoke gaskets are in-place before prefinished door installation at fire-rated doors.

3.2 CLEANING / PROTECTION

- A. Clean prefinished doors and hardware.

END OF SECTION 08210

SECTION 08411 - ALUMINUM STORE FRONTS AND ENTRANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification Sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

- A. Extent of aluminum entrances and storefronts complete with reinforcing, fasteners, anchors and attachment devices as indicated on drawings.
- B. Aluminum storefront entrances and frame types required for this project include:
 - (1) All exterior entrance doors and storefront frames and windows other than aluminum curtainwall systems.
 - (2) Accessories necessary to complete work, including matching prefinished formed aluminum sub-sills and sill flashings with concealed clip anchors, where indicated on drawings.
- C. Glazing: Refer to "Glass and Glazing" section of Division 8 for glazing requirements for aluminum entrances and windows.
- D. Door Hardware is specified under Division 8 – Door Hardware and installed by Store Front supplier or manufacturer for doors in this section.
- E. Related Sections:
 - (1) Section 01400 - Quality Control
 - (2) Section 05500 – Metal Fabrication
 - (3) Section 06100 - Rough Carpentry
 - (4) Section 07920 - Joint Sealants
 - (5) Section 087100 – Door Hardware
 - (6) Section 08800 - Glass and Glazing

1.03 REFERENCES

- A. Aluminum Association (AA):
 - (1) DAF-45 Designation System for Aluminum Finishes.
- B. American Architectural Manufacturers Association (AAMA):
 - (1) 503.1 Test Method for Condensation Resistance of Windows, Doors and Glazed Wall Systems.
 - (2) 605.2-92 Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
 - (3) 607.1 Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.
 - (4) 608.1 Specification and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum.
 - (5) 701.2 Specifications for Pile Weatherstripping.
 - (6) SFM-1 Aluminum Storefront and Entrance Manual.
- C. American National Standards Institute (ANSI):

- (1) A117.1 Safety Standards for the Handicapped.
- D. American Society for Testing and Materials (ASTM):
 - (1) A36 Structural Steel.
 - (2) B209 Aluminum and Aluminum-Alloy Sheet and Plate.
 - (3) B221 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
 - (4) B308 Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.
 - (5) C509 Cellular Elastomeric Pre-formed Gasket and Sealing Material
 - (6) C864 Dense Elastomeric Compression Seal Gaskets, Setting Blocks and Spacers.
 - (7) E283 Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
 - (8) E330 Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
 - (9) E331 Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- E. Federal Specifications (FS):
 - (1) TT-P-645A Primer, Paint, Zinc Chromate, Alkyd Type.
- F. Steel Structures Painting Council (SSPC):
 - (1) Paint 12 Cold-applied Asphalt Mastic (Extra Thick Film).

1.04 SYSTEM REQUIREMENTS

- A. Design Requirements:
 - (1) Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage or moisture disposal.
 - (2) Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
 - (3) Provide concealed fastening.
 - (4) Provide entrance and storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.
 - (5) Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
 - (6) Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
 - (7) Provide for expansion and contraction without detriment to appearance or performance.
 - (8) Assemblies shall be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
 - (9) Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.
- B. Performance Requirements (Exterior Frames):
 - (1) Air infiltration: Air leakage through fixed light areas of storefront shall not exceed 0.06 cfm per square foot (0.0003 m³/sm²) of surface area when tested in accordance with ASTM E283 at differential static pressure of 6.24 psf (300 Pa).
 - (2) Water infiltration: No uncontrolled water penetration when tested in accordance

with ASTM E331 at test pressure of 10.0 psf (480 Pa.).

- C. Thermal Requirements:
 - (1) Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180 deg. F. (82 deg. Celsius) without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.
 - (2) Ensure doors function normally within limits of specified temperature range.
- D. Structural Requirements as measured in accordance with ANSI/ASTM E330:
 - (1) Wind loads for exterior assemblies:
 - (a) Basic loading:
 - (1) 35 psf acting inward
 - (2) 30 psf acting outward.
 - (2) Deflection: Maximum calculated deflection of any framing member in direction normal to plane of wall when subjected to specified design pressures shall not exceed 1/240 of its clear span.
- E. Testing Requirements: Provide components that have been previously tested by an independent testing laboratory.

1.05 SUBMITTALS

- A. General: Submit in accordance with Section 01300.
- B. Product Data:
 - (1) Submit manufacturer=s descriptive literature and product specifications.
 - (2) Include information for factory finishes, hardware, accessories and other required components.
 - (3) Include color charts for finish indicating manufacturer=s standard colors available for selection.
- C. Shop Drawings:
 - (1) Submit shop drawings covering fabrication, installation and finish of specified systems.
 - (2) Include the following:
 - (a) Fully dimensioned plans and elevations with detail coordination keys.
 - (b) Locations of exposed fasteners and joints.
 - (3) Provide detailed drawings of:
 - (a) Composite members.
 - (b) Joint connections for framing systems and for entrance doors.
 - (c) Anchorage.
 - (d) System reinforcements.
 - (e) Expansion and contraction provisions.
 - (f) Glazing methods and accessories.
 - (g) Internal sealant requirements as recommended by sealant manufacturer.
 - (4) Schedule of finishes.
- D. Samples:
 - (1) Submit samples indicating quality of finish, in required colors, on alloys used for work, in sizes as standard with manufacturer.
 - (2) Where normal texture or color variations are expected, include additional samples illustrating range of variation.

E. Test Reports:

- (1) Standard Systems: Submit certified copies of previous test reports substantiating performance of system in lieu of re-testing. Include other supportive data as necessary.

F. Certificates:

- (1) Submit manufacturer=s certification stating that systems are in compliance with specified requirements.

G. Qualification Data:

- (1) Submit installer qualifications verifying years of experience.
- (2) Include list of projects having similar scope of work identified by name, location, date, reference name and phone number.

H. Manufacturer=s Instructions: Submit manufacturer=s printed installation instructions.

1.06 QUALITY ASSURANCE

A. Single Source Responsibility:

- (1) To ensure quality of appearance and performance, obtain materials for each system from either a single manufacturer or from manufacturer approved by each system manufacturer.

B. Installer Qualifications: Certified in writing by Contractor as qualified for installation of specified systems.

C. Perform work in accordance with AAMA SFM-1 and manufacturer=s written instructions.

D. Conform to requirements of ANSI A117.1 and local amendments.

1.07 DELIVERY, STORAGE AND HANDLING

A. Protect finished surfaces as necessary to prevent damage.

B. Do not use adhesive papers or sprayed coatings which become firmly bonded when exposed to sun.

C. Do not leave coating residue on any surfaces.

D. Replace damaged units.

1.08 WARRANTY

A. Provide written manufacturer=s warranty, executed by company official, **warranting against defects in materials and products for 2 years from date of Substantial Completion. Warrant door corner construction for the life of the project.**

B. Provide written installer=s warranty, **warranting work to be watertight, free from defective materials, defective workmanship, glass breakage due to defective design, and agreeing to replace components which fail within 2 years from date of Substantial Completion.**

- (1) Warranty shall cover following:
 - (a) Complete watertight and airtight system installation within specified tolerances.
 - (b) Completed installation will remain free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
 - (c) System is structurally sound and free from distortion.
 - (d) Glass and glazing gaskets will not break or Apop@ from frames due to design wind, expansion or contraction movement.
 - (e) Glazing sealants and gaskets will remain free from abnormal deterioration or dislocation due to sunlight, weather or oxidation.
- C. **Provide written warranty stating organic coating finish will be free from fading more than 10%, chalking, yellowing, peeling, cracking, pitting, corroding or non-uniformity of color, or gloss deterioration beyond manufacturer=s descriptive standards for 5 years from date of Substantial Completion and agreeing to promptly correct defects.**

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

- A. The following specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this section. Equal products by Kawneer, U.S. Aluminum and other manufacturers will be considered subject to ten (10) day prior approval.
- B. BASIS OF DESIGN – APPROVED MANUFACTURER AND SYSTEMS. Subject to compliance with requirements indicated, provide products of the following:
 - (1) Coral Aluminum Products, 3010 Rice Mine Road, Tuscaloosa, AL 35406.
- C. Substitutions:
 - (1) General: Refer to Division 1 Section “Prior Approvals” for procedures and submission requirements.
 - (2) Pre-Contract (Bidding Period) Substitutions: Submit written requests no later than ten (10) days prior to bid date.
 - (3) Substitution Documentation:
 - (a) Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
 - (b) Test Reports: Submit test reports verifying compliance with each test requirement for each aluminum storefront and entrance product required by the project.
 - (c) Product Sample and Finish: Submit product sample, representative of storefront for the project, with specified finish and color.
 - (4) Substitution Acceptance: Acceptance will be by written addendum only.
- D. Acceptable Entrance Doors:
 - (1) Door Types A, B, C and D:
 - (a) Equal to Coral Architectural Products, Series 500 Wide Stile Swing Doors, as indicated on drawings, with Type “DG101” stops for 1” thick insulating glass.

- D. Acceptable Interior Storefront Doors:
- (1) Door Types E and F:
 - (a) Equal to Coral Architectural Products, Series 500 Wide Stile Swing Doors, as indicated on drawings, with stops for 1/4" thick glass.
- D. Acceptable Storefront Framing System:
- (1) Interior Door Frame Types 7, 8, 9 10 and 11:
 - (a) Equal to Coral Architectural Products Storefront System FL 200; 1 3/4"x4 1/2", as indicated on Drawings.
 - (2) Exterior Door Frame Type 1, 2 and 3 (with transom) and Exterior Window Types A, B, C and D:
 - (a) Equal to Coral Architectural Products Thermal Storefront System FL300T; 2"x4 1/2", for 1" thick glazing infill, as indicated on Drawings.
 - (b) Provide radiused transom or window head as indicated on Drawings.

2.02 FRAMING MATERIALS AND ACCESSORIES

- A. Aluminum:
- (1) ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H34 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.
- B. Interior Reinforcing:
- (1) ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.
 - (2) Shapes and sizes to suit installation.
 - (3) Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.
- C. Anchorage Devices:
- (1) Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.
- D. Fasteners:
- (1) Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with components being fastened.
 - (2) Do not use exposed fasteners, except where unavoidable for application of hardware.
 - (3) For exposed locations, provide countersunk Phillips head screws with finish matching items fastened.
 - (4) For concealed locations, provide manufacturer's standard fasteners.
 - (5) Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.
- E. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.
- F. Protective Coatings: Cold-applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil (0.77 mm) thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.
- G. Glazing Gaskets:
- (1) Compression type design, replaceable, molded or extruded, of neoprene, or ethylene propylene diene monomer (EPDM).
 - (2) Conform to ASTM C509 or C864.

- (3) Profile and hardness as required to maintain uniform pressure for watertight seal.
- (4) Provide in manufacturer=s standard black color.
- H. Weatherstripping:
 - (1) Wool pile conforming to AAMA 701.2; or extruded EPDM elastomeric conforming to ASTM C509 or C864.
 - (2) Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.
- I. Internal Sealants: Types recommended by sealant manufacturer.
- J. AAnti-Walk@ Edge Blocking: AW@ shaped EPDM blocks for use in keeping glazing material stationary under vibration or seismic loading.
- K. Baffles (at weep holes): Type as recommended by system manufacturer and shown in published installation instructions.
- L. Thermal Barrier at Thermal Storefront System FL300T locations:
 - (1) Thermal Break consisting of ¼" interrupted separation filled with a two-part chemically curing, high-density polyurethane. Structural integrity is maintained by leaving a measured amount of the aluminum web creating a small integral structural Tab-Link™ and polyurethane adhesive bond.
 - (2) Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
- M. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
 - (1) Surface: Smooth, Flat.
 - (2) Exposed Coil-Coated Finish:
 - (a) Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent (70%) PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - (b) Color: As selected by Architect from manufacturer's full range; to match aluminum storefront framing.
 - (3) Locations: Formed aluminum sill flashings and sub-sills, as indicated on Drawings at storefront frame sills.

2.03 GLASS AND GLAZING ACCESSORIES

- A. Refer to Division 8.

2.04 FABRICATION

- A. Coordination of Fabrication:
 - (1) Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
 - (2) Fabricate units to withstand loads which will be applied when system is in place.
- B. General:
 - (1) Conceal fasteners wherever possible.

- (2) Reinforce work as necessary for performance requirements and for support to structure.
- (3) Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or pre-formed separators which will prevent contact and corrosion.
- (4) Comply with Section 08800 for Glazing requirements.

C. Aluminum Framing:

- (1) Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
- (2) Fabricate frame assemblies with joints straight and tight fitting.
- (3) Reinforce internally with structural members as necessary to support design loads.
- (4) Maintain accurate relation of planes and angles, with hairline fit of contacting members.
- (5) Seal horizontals and direct moisture accumulation to exterior.
- (6) Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
- (7) Provide manufacturer=s extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.
- (8) Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer and FGMA Glazing Manual.
- (9) Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.

D. Entrance Doors:

- (1) Fabricate with mechanical joints using internal reinforcing plates and shear blocks attached with fasteners and by welding.
- (2) Provide extruded aluminum glazing stops of beveled and mitered design, with EPDM glazing gaskets, permanently anchored on security side and removable on opposite side.
- (3) Hardware:
 - (a) Receive hardware supplied in accordance with Section 087100 and install in accordance with requirements of this Section.
 - (b) Cut, reinforce, drill and tap frames and doors as required to receive hardware.
 - (c) Comply with hardware manufacturer=s templates and instructions.
 - (d) Use concealed fasteners wherever possible.

F. Welding:

- (1) Comply with recommendations of the American Welding Society.
- (2) Use recommended electrodes and methods to avoid distortion and discoloration.
- (3) Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

G. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or Aoil-canning@.

2.05 FINISH

- A. Exterior and Interior Storefront and Entrance Frames:
 - (1) Organic Coating (high performance fluoropolymer):
 - (a) Comply with requirements of AAMA 2605.
 - (b) Surfaces cleaned and given conversion coating pre-treatment prior to application of 0.3 mil dry film thickness of epoxy or acrylic primer following recommendations of finish coat manufacturer.
 - (c) Finish coat of 70 percent minimum fluoropolymer resin fused to primed surfaces at temperature recommended by manufacturer, 1.0 mil (0.25 mm) minimum dry film thickness.
 - (d) Acceptable coating manufacturer's: PPG Industries Inc., and The Valspar Corporation.
 - (e) Provide in either 2, 3, or 4 coat system as required for color selected.
 - (f) Manufacturer's standard colors as selected by Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions and proceed with work in accordance with Section 01400.
- B. Verify dimensions, tolerances and method of attachment with other Work.

3.02 INSTALLATION

- A. Erection Tolerances:
 - (1) Limit variations from plumb and level:
 - (a) 1/8 inch (3 mm) in 10 feet (3 M) vertically.
 - (b) 1/8 inch (3 mm) in 20 feet (6 M) horizontally.
 - (2) Limit variations from theoretical locations: 1/4-inch (6 mm) for any member at any location.
 - (3) Limit offsets in theoretical end-to-end and edge-to-edge alignment: 1/16 inch (2 mm) from flush surfaces not more than 2 inches (51 mm) apart or out-of-flush by more than 1/4 inch (6 mm).
- B. Install doors and hardware in accordance with manufacturer=s printed instructions.
- C. Set units plumb, level and true to line, without warp or rack of frame.
- D. Anchor securely in place, allowing for required movement, including expansion and contraction.
- E. Separate dissimilar materials at contact points, including metal in contact with masonry or concrete surfaces, with bituminous paint or pre-formed separators to prevent contact and corrosion.
- F. Seal perimeter members as shown on manufacturer=s installation instructions or as required for unique job conditions. Set other members with internal sealants and baffles as called for in manufacturer=s installation instructions. Use sealants as recommended by sealant manufacturer.
- G. Coordinate installation of perimeter sealant and backing materials between assemblies

and adjacent construction in accordance with requirements of Section 08800.

- H. Glazing: Refer to requirements of Section 08800. Utilize Anti-walk@ edge blocking on all vertical edges of glazing.

3.03 ADJUSTING

- A. Test door operating functions. Adjust closing and latching speeds and other hardware in accordance with manufacturer=s instructions to ensure smooth operation.

3.04 CLEANING

- A. Clean surfaces in compliance with manufacturer=s recommendations; remove excess mastic, mastic smears, foreign materials and other unsightly marks.
- B. Clean metal surfaces exercising care to avoid damage.

END OF SECTION 08411

SECTION 087100

DOOR HARDWARE

PART 1 GENERAL

1. SECTION INCLUDES

- A. Hardware for wood, aluminum, and hollow metal doors.
- B. Hardware for fire-rated doors.
- C. Lock cylinders for doors with balance of hardware specified in other sections.
- D. Thresholds.
- E. Weatherstripping and gasketing.

2. RELATED REQUIREMENTS

- A. Section 062000 - Finish Carpentry: Wood door frames.
- B. Section 064100 - Architectural Wood Casework: Cabinet hardware.
- C. Section 079200 - Joint Sealants: Sealants for setting exterior door thresholds.
- D. Section 080671 - Door Hardware Schedule: Schedule of door hardware sets.
- E. Section 081113 - Hollow Metal Doors and Frames.
- F. Section 081116 - Aluminum Doors and Frames.
- G. Section 081213 - Hollow Metal Frames.
- H. Section 081416 - Flush Wood Doors.
- I. Section 081433 - Stile and Rail Wood Doors.
- J. Section 084313 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.

3. REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2019.
- C. BHMA A156.1 - Standard for Butts and Hinges 2021.
- D. BHMA A156.2 - Bored and Preassembled Locks and Latches 2017.
- E. BHMA A156.3 - Exit Devices 2020.
- F. BHMA A156.4 - Door Controls - Closers 2019.
- G. BHMA A156.5 - Cylinders and Input Devices for Locks 2020.
- H. BHMA A156.6 - Standard for Architectural Door Trim 2021.
- I. BHMA A156.7 - Template Hinge Dimensions 2016.
- J. BHMA A156.13 - Mortise Locks & Latches Series 1000 2017.
- K. BHMA A156.16 - Auxiliary Hardware 2018.
- L. BHMA A156.19 - Power Assist and Low Energy Power Operated Swinging Doors 2019.
- M. BHMA A156.21 - Thresholds 2019.
- N. BHMA A156.22 - Standard for Gasketing 2021.
- O. BHMA A156.26 - Standard for Continuous Hinges 2021.
- P. BHMA A156.28 - Recommended Practices For Mechanical Keying Systems 2018.
- Q. BHMA A156.115 - Hardware Preparation In Steel Doors And Steel Frames 2016.

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- R. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames 2006.
- S. DHI (H&S) - Sequence and Format for the Hardware Schedule 2019.
- T. DHI (KSN) - Keying Systems and Nomenclature 2019.
- U. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames 2004.
- V. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors 1993; also in WDHS-1/WDHS-5 Series, 1996.
- W. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- X. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- Y. ITS (DIR) - Directory of Listed Products current edition.
- Z. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.
- AA. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- BB. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2022.
- CC. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.
- DD. UL (DIR) - Online Certifications Directory Current Edition.
- EE. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.
- FF. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.
- GG. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

4. ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.
- C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
 - 1. Architect.
 - 2. Installer's Architectural Hardware Consultant (AHC).
 - 3. Hardware Installer.
 - 4. Owner's Security Consultant.
- D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- E. Keying Requirements Meeting:
 - 1. Owner will schedule meeting at project site prior to Contractor occupancy.
 - 2. Attendance Required:
 - a. Owner.
 - b. Architect.
 - 3. Agenda:
 - a. Establish keying requirements.
 - b. Verify locksets and locking hardware are functionally correct for project requirements.
 - c. Verify that keying and programming complies with project requirements.
 - d. Establish keying submittal schedule and update requirements.

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4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
6. Deliver established keying requirements to manufacturers.

5. SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings - Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
 - a. Submit in vertical format.
 3. Include complete description for each door listed.
- D. Shop Drawings - Electrified Door Hardware: Include diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
 2. Elevations: Include front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
 3. Diagrams: Include point-to-point wiring diagrams that show each device in door opening system with related colored wire connections to each device.
- E. Samples for Verification:
 1. Submit minimum size of 2 by 4 inch (51 by 102 mm) for sheet samples, and minimum length of 4 inch (102 mm) for other products.
 2. Submit one (1) sample of hinge, latchset, lockset, closer, and [] illustrating style, color, and finish.
 3. Include product description with samples.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Supplier's qualification statement.
- J. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- K. Keying Schedule:
 1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.
- L. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- M. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
- N. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.

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1. See Section 016000 - Product Requirements, for additional provisions.

6. QUALITY ASSURANCE

- A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.
- D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

7. DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

8. WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
 1. Closers: 25 years, minimum.
 2. Exit Devices: Three years, minimum.
 3. Locksets and Cylinders: Three years, minimum.

PART 2 PRODUCTS

9. GENERAL REQUIREMENTS

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Locks: Provide a lock for each door, unless it's indicated that lock is not required.
 1. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's Series. As indicated in hardware sets.
 2. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.
 3. Strikes:
 - a. Finish: To match lock or latch.
 - b. Curved-Lip Strikes: Provide as standard, with extended lip to protect frame, unless otherwise indicated.
 - c. Center Strike At Pairs of Doors: 7/8 inch (22.2 mm) lip.
- D. Door Pulls and Push Plates:
 1. Provide door pulls and push plates on doors without a lockset, latchset, exit device, or auxiliary lock unless otherwise indicated.
- E. Closers:
 1. Provide door closer on each exterior door, unless otherwise indicated.
 2. Provide door closer on each fire-rated and smoke-rated door.
 3. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
- F. Drip Guards: Provide at head of outswinging exterior doors unless protected by roof or canopy directly overhead.
- G. Weatherstripping and Gasketing:
 1. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
 2. Provide door bottom sweep as indicated in hardware set, unless otherwise indicated.

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H. Fasteners:

1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 - a. Aluminum fasteners are not permitted.
 - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
 - a. Self-drilling (Tek) type screws are not permitted.
3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
4. Provide wall grip inserts for hollow wall construction.
5. Fire-Resistance-Rated Applications: Comply with NFPA 80.
 - a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
 - b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

10. PERFORMANCE REQUIREMENTS

A. Provide door hardware products that comply with the following requirements:

1. Applicable provisions of federal, state, and local codes.
 - a. IBC.
 - b. NFPA 101.
2. Accessibility: ADA Standards and ICC A117.1.
3. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
4. Hardware on Fire-Resistance-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), testing firm acceptable to authorities having jurisdiction, or [] as suitable for application indicated.
5. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide door hardware that complies with local codes, and requirements of assemblies tested in accordance with UL 1784.
6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
7. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
8. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

11. HINGES

A. Manufacturers: Conventional butt hinges.

1. BEST; dormakaba Group: www.bestaccess.com/#sle.

B. Properties:

1. Butt Hinges: As applicable to each item specified.
 - a. Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.
 - b. Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.
 - c. Template screw hole locations.
 - d. Bearing assembly installed after plating.
 - e. Bearings: Concealed fully hardened bearings.
 - f. Bearing Shells: Shapes consistent with barrels.
 - g. Pins: Easily seated, non-rising pins.
 - 1) Fully plate hinge pins.
 - 2) Non-Removable Pins: Slotted stainless steel screws.
 - h. UL 10C listed for fire-resistance-rated doors.

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2. Continuous Hinges: As applicable to each item specified.
 - a. Geared Continuous Hinges: As applicable to each item specified.
 - 1) Non-handed.
 - 2) Anti-spinning through-fastener.
 - 3) UL 10C listed for fire-resistance-rated doors.
 - (a) Metal Door Installation: Rated up to 90 minutes.
 - (b) Wood Door Installation: Rated up to 60 minutes.
 - 4) Sufficient size to permit door to swing 180 degrees
- C. Sizes: See Door Hardware Schedule.
 1. Hinge Widths: As required to clear surrounding trim.
 2. Sufficient size to allow 180 degree swing of door.
- D. Finishes: See Door Hardware Schedule.
 1. Fully polish hinges; front, back, and barrel.
- E. Grades:
 1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
 2. Continuous Hinges: Comply with BHMA A156.26, Grade 1.
- F. Material: Base metal as indicated for each item by BHMA material and finish designation.
- G. Types:
 1. Butt Hinges: Include full mortise hinges.
 2. Continuous Hinges: Include geared hinges.
- H. Quantities:
 1. Butt Hinges: Three (3) hinges per leaves up to 90 inches (2286 mm) in height. Add one (1) for each additional 30 inches (762 mm) in height or fraction thereof.
 - a. Hinge weight and size unless otherwise indicated in hardware sets:
 - 1) For doors up to 36 inches (914 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.134 inch (3.4 mm) and a minimum of 4-1/2 inches (114 mm) in height.
 - 2) For doors from 36 inches (914 mm) wide up to 42 inches (1067 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.145 inch (3.7 mm) and a minimum of 4-1/2 inches (114 mm) in height.
 - 3) For doors from 42 inches (1067 mm) wide up to 48 inches (1219 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
 - 4) For doors greater than 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
 2. Continuous Hinges: One per door leaf.
- I. Applications: At swinging doors.
 1. Provide non-removable pins at out-swinging doors with locking hardware and all exterior doors.
- J. Products:
 1. Butt Hinges:
 - a. Ball Bearing, Five (5) Knuckle.
 2. Continuous Hinges:
 - a. Aluminum geared hinges.

12. BOLTS

- A. Manufacturers:
 1. Trimco: www.trimcohardware.com/#sle.
- B. Properties:
 1. Flush Bolts:

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- a. Manual Flush Bolts: Manually latching upon closing of door leaf.
 - 1) Bolt Throw: 3/4 inch (19 mm), minimum.
 - 2. Dustproof Strikes: For bolting into floor, provide except at metal thresholds.
- C. Options:
 - 1. Extension Bolts: In leading edge of door, one bolt into floor, one bolt into top of frame.
- D. Products:
 - 1. Manual flush bolts.

13. EXIT DEVICES

- A. Manufacturers:
 - 1. BEST, dormakaba Group: www.bestaccess.com/#sle.
- B. Properties:
 - 1. Actuation: Crossbar.
 - 2. Touchpads: 'T' style metal touchpads and rail assemblies with matching chassis covers end caps.
 - 3. Latch Bolts: Stainless steel deadlocking with 3/4-inch (19 mm) projection using latch bolt.
 - 4. Lever Design: Match project standard lockset trims.
 - 5. Cylinder: Include where cylinder dogging or locking trim is indicated.
 - 6. Strike as recommended by manufacturer for application indicated.
 - 7. Sound dampening on touch bar.
 - 8. Dogging:
 - a. Non-Fire-Resistance-Rated Devices: Hex key 1/4-inch (6 mm) hex key dogging.
 - b. Fire-Resistance-Rated Devices: Manual dogging not permitted.
 - 9. Touch bar assembly on wide style exit devices to have a 1/4-inch (6.3 mm) clearance to allow for vision frames.
 - 10. All exposed exit device components to be of architectural metals and "true" architectural finishes.
 - 11. Handing: Field-reversible.
 - 12. Fasteners on Back Side of Device Channel: Concealed - exposed fasteners not allowed.
 - 13. Vertical Latch Assemblies' Operation: Gravity, without use of springs.
- C. Grades: Complying with BHMA A156.3, Grade 1.
 - 1. Provide exit devices tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.
- D. Options:
- E. Products:
 - 1. 2000.

14. REMOVABLE MULLIONS

- A. Manufacturers:
 - 1. BEST, dormakaba Group: www.bestaccess.com/#sle.
- B. Properties:
 - 1. Rectangular shape 3 inches (76 mm) by 2 inches (51 mm) tubes with minimum 1/8 inch (3.2 mm) wall thickness.
 - 2. Furnished by the same manufacturer as exit devices.
 - 3. Pre-drilled holes for installation of exit device strikes.
 - 4. Spacers: Provide as required for proper installation, based on frame profile and dimensions.
- C. Grades: Complying with BHMA A156.3.
- D. Materials: Manufacturer's standard for items specified.
 - 1. Top and Bottom Brackets: Investment-cast steel.

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- E. Options:
 - 1. Furnish Keyed Removable "KR" feature and corresponding cylinders as specified.
 - a. Mullions capable of being installed without physical key present.
 - b. Physical key required to operate.
- F. Applications: As indicated on drawings and in Door Hardware Schedule.
- G. Products:
 - 1. 822 Series.

15. LOCK CYLINDERS

- A. Manufacturers:
 - 1. BEST, dormakaba Group: www.bestaccess.com/#sle.
- B. Properties:
 - 1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
 - a. Provide cylinders from same manufacturer as locking device.
 - b. Provide cams and/or tailpieces as required for locking devices.
 - c. Provide cylinders with appropriate format conventional cores where indicated.
- C. Grades:
 - 1. Standard Security Cylinders: Comply with BHMA A156.5.
- D. Material:
 - 1. Manufacturer's standard corrosion-resistant brass alloy.
- E. Types: As applicable to each item specified.
 - 1. Standard security small format interchangeable core (SFIC) type cylinders, with seven-pin, 1C - 7-pin cores.
- F. Applications: At locations indicated in hardware sets, and as follows
 - 1. As required for items with locking devices provided by other sections, including at elevator controls and cabinets.
 - a. When provisions for lock cylinders are referenced elsewhere in the Project Manual to this Section, provide compatible type of lock cylinder, keyed to building keying system, unless otherwise indicated.
- G. Products:
 - 1. Rim/mortise 12E/1E.

16. MORTISE LOCKS

- A. Manufacturers:
 - 1. BEST, dormakaba Group: www.bestaccess.com/#sle.
- B. Properties:
 - 1. Mechanical Locks: Manufacturer's standard.
 - a. Fitting modified ANSI A115.1 door preparation.
 - b. Door Thickness Coordination Fitting 1-3/4 inch (44 mm) to 2-1/4 inch (57 mm) thick doors.
 - c. Latch: Solid, one-piece, anti-friction, self-lubricating stainless steel.
 - 1) Latchbolt Throw: 3/4 inch (19 mm), minimum.
 - d. Auxiliary Deadlatch: One-piece stainless steel, permanently lubricated.
 - e. Backset: 2-3/4 inch (70 mm).
 - f. Lever Trim:
 - 1) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
 - 2) Strength: Locksets outside locked lever designed to withstand minimum 1,400 inch-lbs (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
 - 3) Spindle: Designed to prevent forced entry from attacking of lever.

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- 4) Independent spring mechanism for each lever.
 - (a) Trim to be self-aligning and thru-bolted.
 - 5) Handles: Made of forged or cast brass, bronze, or stainless-steel construction. Levers that contain a hollow cavity are not acceptable.
 - 6) Levers to operate a roller bearing spindle hub mechanism.
- C. Finishes: See Door Hardware Schedule.
 - 1. Core Faces: Match finish of lockset.
- D. Grades:
 - 1. Comply with BHMA A156.13, Grade 1, Security, Grade 1.
 - a. Durability: Passing 4 million cycles tests verified by third party testing agency.
- E. Options:
 - 1. Provide locksets made in a manufacturing facility to compliant with ISO 9001-Quality Management and ISO 14001-Environmental Management.
- F. Products: Mortise locks, including standard types.
 - 1. 40H.

17. DOOR PULLS AND PUSH PLATES

- A. Manufacturers:
 - 1. Trimco: www.trimcohardware.com/#sle.
- B. Properties:
 - 1. Pull Type: Offset, unless otherwise indicated.
 - 2. Push Plate Type: [____], unless otherwise indicated.
 - a. Edges: Beveled, unless otherwise indicated.
- C. Grades: Comply with BHMA A156.6.
- D. Material: Stainless steel, unless otherwise indicated.
- E. Products:
 - 1. Push Plates 1001-9.
 - 2. Pull Plate 1017-3B.

18. DOOR PULLS AND PUSH BARS

- A. Manufacturers:
 - 1. Trimco: www.trimcohardware.com/#sle.
- B. Properties:
 - 1. Bar Type: Bar set, unless otherwise indicated.
 - 2. Pulls and Handles:
 - a. Tubular Bars:
 - 1) Bar Diameter: 1 inch (25 mm).
- C. Grades: Comply with BHMA A156.6.
- D. Material: Stainless steel, unless otherwise indicated.
- E. Products:
 - 1. Push and Pull Bars.

19. COORDINATORS

- A. Manufacturers:
 - 1. Trimco: www.trimcohardware.com/#sle.
- B. Properties:
 - 1. General: Non-handed devices, with field-selectable active door leaf.
- C. Grades:
 - 1. Closer and Coordinator Combinations: Comply with BHMA A156.4, Grade 1.

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- D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.
 - 1. Meet UL 10C for Positive Pressure.
- E. Types:
 - 1. Coordinators: Bar.
- F. Installation:
 - 1. Mounting: Provide necessary mounting brackets and filler bars to ensure proper installation of coordinator and related hardware.
 - 2. Coordination: Properly sequence installation of other door hardware affected by placement of coordinators and carry bars.
- G. Products:

20. CLOSERS

- A. Manufacturers:
 - 1. BEST, dormakaba Group www.bestaccess.com/#sle.
 - 2. dormakaba; dormakaba Group: www.dormakaba.com/us-en/#sle.
- B. Properties:
 - 1. Surface Mounted Closers: Manufacturer's standard.
 - a. Construction: R14 high silicon aluminum alloy.
 - b. Mechanism: Separate tamper-resistant adjusting valves for closing and latching speeds.
 - c. Hydraulic Fluid: All-weather type.
 - d. Arm Assembly: Standard for product specified.
 - 1) Include hold-open, integral stop, or spring-loaded stop feature, as specified in Door Hardware Schedule.
 - 2) Parallel arm to be a heavy-duty rigid arm.
 - 3) Where "IS" or "S-IS" arms are specified in hardware sets, if manufacturer does not offer this arm provide a regular arm mount closer in conjunction with a heavy-duty overhead stop equal to a dormakaba 900 Series.
 - e. Covers:
 - 1) Type: Standard for product selected.
 - (a) Full.
 - 2) Material: Plastic.
 - 3) Finish: Painted.
- C. Grades:
 - 1. Closers: Comply with BHMA A156.4, Grade 1.
 - a. Underwriters Laboratories Compliance:
 - 1) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
 - (a) UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.
- D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.
 - 1. Devices listed with California Department of Forestry and Fire Protection, Office of the State Fire Marshal.
- E. Types:
 - 1. Rack-and-pinion, surface-mounted. 1-1/2 inches (38 mm) minimum bore.
- F. Options:
 - 1. Delayed action, adjustable with an independent valve.
- G. Installation:
 - 1. Mounting: Includes surface mounted installations.
 - 2. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.

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3. At out swinging exterior doors, mount closer on interior side of door.
4. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
5. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.

H. Products:

1. Surface Mounted:
 - a. 8900.

21. SWINGING DOOR OPERATORS

A. Manufacturers:

1. dormakaba; dormakaba Group: www.dormakaba.com/us-en/#sle.
2. See Section 087113 Auto Operators .

B. Properties:

1. Where automatic operators are scheduled, provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by the manufacturer of the automatic operator for each individual leaf. Control both doors with actuators simultaneously at pairs. Locate actuators, key switches, and other controls as directed by Architect.
2. Power-Assist Low Energy Operators:
 - a. Construction: Manufacturer's standard units with full covers.
 - b. Door Operation Limits:
 - 1) Weight: 220 lbs (100 kg).
 - 2) Width: 48 inches (1219 mm).
 - 3) Temperature Range: 5 to 122 degrees F (Minus 15 to 50 degrees C).
 - c. Function Adjustability: Selectable low-energy or power-assist applications. Low-energy function to cycle the door open as programmed. Power-assist function for decreased opening force when manually operated. Operator to have a programmable push-and-go functionality.
 - d. Auxiliary Power Supply: 24VDC, 1.5A and form C relay contact for controlling fail safe/secure locking devices 50VAC or DC at 1A max.
 - e. Programmable Operation: Include sweep speed, latch speed, and backcheck cushioning.
 - f. Power-Open Functions: Include delay time, opening time, opening force, and opening angle.
 - 1) Angle and door width selector.
 - 2) Power boost feature.
 - g. On-board cycle counter.
 - h. Selectable jumper to accommodate push or pull side applications.
 - i. On/off strike delay when the operator must delay while a locking device releases.
 - j. Selectable on/off obstacle detection on closing.

C. Grades:

1. Comply with BHMA A156.19.
2. Underwriters Laboratories Compliance:
 - a. Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
 - b. United States: UL 325.
3. California State Fire Marshal Approved.

D. Types:

1. Power-Assist Low-Energy Operators:

E. Options: As applicable to each item specified.

1. Delayed action, adjustable with an independent valve.
2. Advanced backcheck.

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3. Heavy-duty arms and knuckles/elbows.
4. Adjustable, for force or angle of opening hold open.
5. Cushion limit stay.

F. Installation:

G. Products:

1. ED900.

22. PROTECTION PLATES

A. Manufacturers:

1. Trimco: www.trimcohardware.com/#sle.

B. Properties:

1. Plates:

- a. Armor Plates: Provide on bottom half of push side of doors that require protection from objects moving through openings that may damage door surface.
 - 1) Size: 30" high by 1-inch (38 mm) less door width (LDW) on pull side and 2 inch (51 mm) LDW on push side of door.
- b. Kick Plates: Provide along bottom edge of push side of every wood door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
 - 1) Size: high by 2 inch (51 mm) less door width (LDW) on push side of door.
- c. Mop Plates: Provide along bottom edge of push side of doors to provide protection from cleaning liquids and equipment damage to door surface.
 - 1) Size: 4-inch (152 mm) high by 1 inch (38 mm) less door width (LDW) on pull side and 2 inch (51 mm) LDW on push side of door.
- d. Edges: Beveled, on four (4) unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: As indicated for each item by BHMA material and finish designation.

1. Metal Properties: Stainless steel.

- a. Metal, Standard Duty: Thickness 0.050 inch (1.27 mm), minimum.

E. Installation:

1. Fasteners: Countersunk screw fasteners

F. Products: K0050, K6000

23. STOPS AND HOLDERS

A. Manufacturers:

1. Trimco: www.trimcohardware.com/#sle.

B. General:

C. Properties:

1. Wall Bumpers: 1270 WV.

D. Grades:

1. Door Holders and Wall Bumpers: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.

E. Material: Base metal as indicated for each item by BHMA material and finish designation.

F. Types:

1. Wall Bumpers: Bumper, concave, wall stop.

G. Installation:

1. Non-Masonry Walls: Confirm adequate wall reinforcement has been installed to allow lasting installation of wall bumpers.

H. Products:

1. Wall Bumpers 1270WV.

24. THRESHOLDS

- A. Manufacturers:
 - 1. National Guard Products, Inc: www.ngpinc.com/#sle.
- B. Properties:
 - 1. Threshold Surface: Fluted horizontal grooves across full width.
- C. Grades: Thresholds: Comply with BHMA A156.21.
- D. Products:
 - 1. 896

25. WEATHERSTRIPPING AND GASKETING

- A. Manufacturers:
 - 1. National Guard Products, Inc: www.ngpinc.com/#sle.
- B. Properties:
 - 1. Weatherstripping Air Leakage Performance: Not exceeding of door opening at 0.3 inches of water pressure differential for single doors, and of door area at 0.3 inches of water pressure differential for double doors for gasketing other than smoke control, as tested according to ASTM E283/E283M; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 - 2. Adhesive-Backed Perimeter Gasketing: Silicone gasket material applied to frame with self- adhesive.
 - 3. Door Sweeps: Neoprene gasket material held in place by flat aluminum housing or flange; surface mounted to face of door with screws.
- C. Grades: Comply with BHMA A156.22.
- D. Products:
 - 1. Weatherstripping: See Door Hardware Schedule.
 - 2. Smoke Seals: See Door Hardware Schedule.
 - 3. Meeting Stile Seals: See Door Hardware Schedule.
 - 4. Door Bottom Seals:
 - a. Door Sweeps: See Door Hardware Schedule.

26. MISCELLANEOUS ITEMS

- A. Manufacturers:
 - 1. Trimco: www.trimcohardware.com/#sle.
- B. Properties:
 - 1. Coat Hooks: Provide on room side of door, screw fastened.
 - a. Material: Stainless steel.
 - 2. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
 - a. Single Door: Provide three on strike jamb of frame.
 - b. Pair of Doors: Provide two on head of frame, one for each door at latch side.
 - c. Material: Rubber, gray color.
- C. Products:
 - 1. Coat Hooks.
 - 2. Silencers.

27. ELECTRIFIED HARDWARE

- A. Manufacturers:
 - 1. BEST, dormakaba Group: www.bestaccess.com/#sle.
- B. Properties:
 - 1. Power Supply Units: Manufacturer's standard.
 - a. Enclosures: Lockable NEMA Type 1, with hinged cover and knockouts.

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- b. Power: 24 VAC, 10 Amp; field-selectable.
 - c. Emergency Release Terminals: Designed to release devices upon activation of fire alarm system.
 - d. Auxiliary contacts for remote signaling.
 - e. User-selectable time delay from 0 to 4 minutes.
 - f. Capable of incorporating up to four (4) control modules, one per each controlled device.
 - g. Fire Alarm System Interface: Standard.
 - 1) Fire alarm terminal with green and red LED indicating fire alarm activation.
 - h. Output Distribution Board with indicator LEDs.
 - i. Battery backup.
 - j. On/Off LED power indicator.
 - 2. Power Transfers: Manufacturer's standard.
 - 3. Wire Harnesses: Of sufficient length, with quick connectors.
 - a. Wire Harness End Connection to Power Supply or Junction Box: One end with bare leads.
- C. Products:
- 1. Power Supplies:
 - a. ELR150.
 - 2. Power Transfers:
 - a. EPT-2.
 - b. EPT-12C.
 - 3. Wire Harnesses:
 - a. BEST wire harnesses.

28. KEYS AND CORES

- A. Manufacturers:
- 1. BEST, dormakaba Group: www.bestaccess.com/#sle.
 - 2. Substitutions: Not permitted.
- B. Properties: Complying with guidelines of BHMA A156.28.
- 1. Provide small format interchangeable core.
 - 2. Provide keying information in compliance with DHI standards.
 - 3. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
 - 4. Keying: Master keyed.
 - 5. Include construction keying and control keying with removable core cylinders.
 - 6. Supply keys in following quantities:
 - a. Master Keys: 4 each.
 - b. Construction Master Keys: 6 each.
 - c. Construction Keys: 15 each.
 - d. Construction Control Keys: 2 each.
 - e. Control Keys if New System: 2 each.
 - f. Change Keys: 2 each for each keyed core.
 - 7. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
 - 8. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.
 - 9. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
 - 10. Include installation of permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.
- C. Products:

29. FINISHES

- A. Finishes: Identified in Hardware Sets.

PART 3 EXECUTION

30. EXAMINATION

- A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.
- B. Correct all defects prior to proceeding with installation.
- C. Verify that electric power is available to power operated devices and of correct characteristics.

31. INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Install hardware using the manufacturer's fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use "Riv-Nuts" or similar products.
- C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
- D. Install hardware for smoke and draft control doors in accordance with NFPA 105.
- E. Use templates provided by hardware item manufacturer.
- F. Do not install surface mounted items until application of finishes to substrate are fully completed.
- G. Wash down masonry walls and complete painting or staining of doors and frames.
- H. Complete finish flooring prior to installation of thresholds.
- I. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list, unless noted otherwise in Door Hardware Schedule or on drawings.
 - 1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
 - 2. For Steel Doors and Frames: See Section 6549.
 - 3. For Steel Door Frames: See Section 081213.
 - 4. For Aluminum-Framed Storefront Doors and Frames: See Section 084313.
 - 5. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
 - 6. Flush Wood Doors: See Section 081416.
 - 7. Stile and Rail Wood Doors: See Section 081433.
 - 8. Mounting heights in compliance with ADA Standards:
 - a. Locksets: 40-5/16 inch (1024 mm).
 - b. Push Plates/Pull Bars: 42 inch (1067 mm).
 - c. Deadlocks (Deadbolts): 48 inch (1219 mm).
 - d. Exit Devices: 40-5/16 inch (1024 mm).
 - e. Door Viewer: 43 inch (1092 mm); standard height 60 inch (1524 mm).
- J. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal, anchor thresholds with stainless steel countersunk screws.
- K. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

32. ADJUSTING

- A. Adjust work under provisions of Section 017000 - Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

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33. CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

34. PROTECTION

- A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

35. HARDWARE SETS

Manufacturer List

Code	Name
BE	Best Access Systems
BY	By Related Section
DM	Dorma Door Controls
NA	National Guard
PR	BEST Precision Exit Devices
ST	BEST Hinges and Sliding
TR	Trimco

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Option List

<u>Code</u>	<u>Description</u>
36"	36" Door Width
3RO	Prefix option for 2000 Apex Series
B4E-HEAVY-AP	BEVELED 4 EDGES - ARMOR PLATES
B4E-HEAVY-KP	BEVELED 4 EDGES - KICK PLATES
C	QUICK CONNECT WIRING OPTION
C4	CAM-STANDARD CAM
CA-03	Cylinder Attachment Kit (Rim/SVR Device)
CD	CYLINDER DOGGING
CSK	COUNTER SINKING OF KICK and MOP PLATES
CSK-AP	COUNTER SINKING OF ARMOUR PLATES
ELR	ELECTRIC LATCH RETRACTION
EPT-Prep	EPT Prep
LAR	Length as required
LBR	LESS BOTTOM ROD
LD	Less Dogging
LS	LATCHBOLT MONITOR SWITCH
SNB (2)	SEX BOLTS (2)
TDS	TOUCHBAR MONITORING DOUBLE SWITCH
UL Rated - Stamp	UL Rated - Stamp
VIB	Double Visual Indicator Option

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Finish List

<u>Code</u>	<u>Description</u>
26D	Satin Chrome
626	Satin Chromium Plated
626AM	Satin Chrome - Antimicrobial Coating
628	Satin Aluminum, Clear Anodized
630	Satin Stainless Steel
630AM	Satin Stainless - Antimicrobial Coating
689	Aluminum Painted
696	Satin Brass Painted
710CU	CuVerro Steralloy
AL	Aluminum
GREY	Grey
Silver	Silver

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Hardware Sets

Set #01

Doors: 100

1	Continuous Hinge-Active Leaf	HD1100A 95" EPT-Prep		NA
1	Power Transfer-Active Leaf	EPT-12C		PR
1	Continuous Hinge-Inactive Leaf	HD1100A 95"		NA
1	Keyed Removeable Mullion	KR822689		PR
1	Mullion Seal	5100N-86 86"		NA
1	Exit Device-Dummy Pull	3RO 2102 36" CD SNB (2)	630AM	PR
1	Exit Device-Storeroom/Pull	3RO C ELR LS TDS 2103 36" CA-03 CD	630AM	PR
2	Rim Cylinder-Exit Trim/Mullion	12E-72 PATD	626	BE
2	Mortise Cylinder	1E-74 PATD C4	626	BE
1	Closer w/ Spring Stop-Inact. Leaf	8916 S-DS	689	DM
1	Single Auto Oper-Active Leaf	See Section 087113 Auto Operators	628	BY
2	Actuator	See Section 087113 Auto Operators	696	BY
1	Door Sweep	C627 A x LAR		NA
1	Threshold	896 S x LAR	AL	NA
1	Wiring Harness-Active Leaf	WH-6E		ST
1	Wiring Harness-Active Leaf	WH-32P		ST
1	Wiring Harness-Active Leaf	WH-192P		ST
1	Power Supply-Exit Device	ELR152		PR
NOTE: (Required purchase from Exit Device Mfg.)				
2	Door Pull	1191-3	710CU	TR
1	Power Supply-Access Control	By Access Control Provider		BY
1	Perimeter Gaskets	By Aluminum Door Manufacturer		BY
1	Manual Push Button	By Access Control Provider		BY
NOTE: (Manual Release Button to be located at Receptionist Desk 101)				
2	Door Position Switch	By Access Control Provider		BY

Set #02

Doors: 118, 125

2	Continuous Hinge-Inactive Leaf	HD1100A 83"		NA
2	Continuous Hinge-Active Leaf	HD1100A 83" EPT-Prep		NA
1	Power Transfer	EPT-12C		PR
1	Keyed Removeable Mullion	KR822	689	PR
1	Mullion Seal	5100N-86 86"		NA
1	Exit Device-Dummy Pull	3RO 2102 36" CD SNB (2)	630AM	PR
1	Exit Device-Storeroom/Pull	3RO C ELR LS TDS 2103 36" CA-03 CD	630AM	PR
2	Rim Cylinder-Exit Trim/Mullion	12E-72 PATD	626	BE
2	Mortise Cylinder-Cyl Dogging	1E-74 PATD C4	626	BE
2	Door Pull	1191-3	710CU	TR
2	Closer w/ Spring Stop	8916 S-DS	689	DM
2	Door Sweep	C627 A x LAR		NA
1	Perimeter Gaskets	By Aluminum Door Manufacturer		BY
1	Threshold	896 S x LAR	AL	NA
1	Wiring Harness-Active Leaf	WH-6E		ST
1	Wiring Harness-Active Leaf	WH-32P		ST
1	Wiring Harness-Active Leaf	WH-192P		ST
1	Power Supply-Exit Device	ELR152		PR
NOTE: (Required purchase from Exit Device Mfg.)				

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1	Power Supply-Access Control	By Access Control Provider	BY
1	Manual Push Button	By Access Control Provider	BY
NOTE: (Manual Release Button to be located at Receptionist Desk 101)			
2	Door Position Switch	By Access Control Provider	BY

Set #03

Doors: 130

2	Continuous Hinge-Inactive Leaf	HD1100A 83"	NA
2	Continuous Hinge-Act Leaf	HD1100A 83" EPT-Prep	NA
1	Power Transfer	EPT-12C	PR
1	Keyed Removeable Mullion	KR822	689 PR
1	Mullion Seal	5100N-86 86"	NA
1	Exit Device-Dummy Pull	3RO 2102 36" CD SNB (2)	630AM PR
1	Exit Device-Storeroom/Pull	3RO C ELR LS TDS 2103 36" CA-03 CD	630AM PR
2	Door Pull	1191-3	710CU TR
2	Rim Cylinder-Exit Trim/Mullion	12E-72 PATD	626 BE
2	Mortise Cylinder-Cylinder Dogging	1E-74 PATD C4	626 BE
2	Closer w/ Spring Stop	8916 S-DS	689 DM
2	Kick Plate	K0050 8" x 2" LDW B4E CSK	630 TR
2	Door Sweep	C627 A x LAR	NA
1	Perimeter Gaskets	By Aluminum Door Manufacturer	BY
1	Threshold	896 S x LAR	AL NA
1	Wiring Harness-Active Leaf	WH-6E	ST
1	Wiring Harness-Active Leaf	WH-32P	ST
1	Wiring Harness-Active Leaf	WH-192P	ST
1	Power Supply-Exit Device	ELR152	PR
NOTE: (Required purchase from Exit Device Mfg.)			
1	Power Supply-Access Control	By Access Control Provider	BY
1	Manual Push Button	By Access Control Provider	BY
2	Door Position Switch	By Access Control Provider	BY

Set #04

Doors: 109

1	Continuous Hinge	HD1100A 83" EPT-Prep	NA
1	Exit Device-Storeroom/Pull	3RO C ELR LS TDS 2103 36" CA-03 CD	630AM PR
1	Rim Cylinder-Exit Trim/Mullion	12E-72 PATD	626 BE
1	Mortise Cylinder-Cylinder Dogging	1E-74 PATD C4	626 BE
1	Door Pull	1191-3	710CU TR
1	Closer w/ Spring Stop	8916 S-DS	689 DM
1	Door Sweep	C627 A x LAR	NA
1	Perimeter Gaskets	By Aluminum Door Manufacturer	BY
1	Threshold	896 S x LAR	AL NA
1	Wiring Harness-Active Leaf	WH-6E	ST
1	Wiring Harness-Active Leaf	WH-32P	ST
1	Wiring Harness-Active Leaf	WH-192P	ST
1	Power Supply-Exit Device	ELR152	PR
NOTE: (Required purchase from Exit Device Mfg.)			
1	Power Supply-Access Control	By Access Control Provider	BY
1	Manual Push Button	By Access Control Provider	BY
1	Door Position Switch	By Access Control Provider	BY

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Set #05

Doors: 100A

3	Heavy Duty Full Mortise Hinge	FBF168 4.5" x 4.5" NRP	26D	ST
1	Power Transfer	EPT-12C		PR
1	Exit Device-Storeroom/Pull	3RO C ELR LS TDS 2103 36" CA-03 CD	630AM	PR
1	Door Pull	1191-3	710CU	TR
1	Rim Cylinder-Exit Trim/Mullion	12E-72 PATD	626	BE
1	Mortise Cylinder-Cylinder Dogging	1E-74 PATD C4	626	BE
1	Closer w/ Spring Stop	8916 S-DS	689	DM
1	Door Sweep	C627 A x LAR		NA
1	Perimeter Gaskets	2525 C x LAR		NA
1	Threshold	896 S x LAR	AL	NA
1	Wiring Harness-Active Leaf	WH-6E		ST
1	Wiring Harness-Active Leaf	WH-32P		ST
1	Wiring Harness-Active Leaf	WH-192P		ST
1	Power Supply-Exit Device	ELR152		PR
NOTE: (Required purchase from Exit Device Mfg.)				
1	Power Supply-Access Control	By Access Control Provider		BY
1	Manual Push Button	By Access Control Provider		BY
1	Door Position Switch	By Access Control Provider		BY
1	Card Reader	By Access Control Provider		BY

Set #06

Doors: 121, 121A

1	Continuous Hinge	HD1100A 83"		NA
1	Exit Device-Storeroom	2803 X C03 CD LBR	630AM	PR
1	Door Pull	1191-3	710CU	TR
1	Closer w/ Spring Stop	8916 S-DS	689	DM
1	Perimeter Gaskets	By Aluminum Door Manufacturer		BY

Set #07

Doors: 123

2	Continuous Hinge	HD1100A 83"		NA
2	Manual Flushbolt	3917-12	626	TR
1	Lockset-Storeroom w/ Deadbolt	45H-7TD15H PATD	630AM	BE
1	Coordinator	3094B2	Silver	TR
2	Mounting Bracket	3096	Silver	TR
2	Closer w/ Stop & Hold	8916 DST	689	DM
2	Kick Plate	K0050 8" x 1" LDW B4E CSK	630	TR
1	Overlapping Astragal	By Metal Door Provider		BY
1	Perimeter Gaskets	2525 C x LAR		NA
2	Door Sweep	101 VA x LAR		NA
1	Drip Cap	16 A - +4" ODW		NA
1	Threshold	896 S x LAR	AL	NA
2	Silencer	1229A	GREY	TR

Set #08

Doors: 101

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3	Std Duty Full Mortise Hinge	FBF179 4.5" x 4.5"	26D	ST
1	Lockset-Office	45H-7AT15H PATD	626AM	BE
1	Kick Plate	K0050 8" x 34" B4E-HEAVY-KP CSK	630	TR
1	Wall Bumper	1270WV	630	TR
1	Perimeter Gasketing	2525 C x LAR		NA
3	Silencer	1229A	GREY	TR

Set #09

Doors: 102, 112, 113, 127

3	Std Duty Full Mortise Hinge	FBF179 4.5" x 4.5"	26D	ST
1	Lockset-Office	45H-7AT15H PATD	626AM	BE
1	Wall Bumper	1270WV	630	TR
1	Perimeter Gasketing	2525 C x LAR		NA
3	Silencer	1229A	GREY	TR

Set #10

Doors: 104

3	Heavy Duty Full Mortise Hinge	FBF168 4.5" x 4.5"	26D	ST
1	Lockset-Classroom	45H-7R15H PATD	626AM	BE
1	Closer w/ Spring Stop	8916 S-DS	689	DM
1	Kick Plate	K0050 8" x 2" LDW B4E CSK	630	TR
1	Perimeter Gaskets	2525 C x LAR		NA
3	Silencer	1229A	GREY	TR

Set #11

Doors: 103

3	Std Duty Full Mortise Hinge	FBF179 4.5" x 4.5"	26D	ST
1	Lockset-Classroom	45H-7R15H PATD	626AM	BE
1	Wall Bumper	1270WV	630	TR
1	Perimeter Gaskets	2525 C x LAR		NA
3	Silencer	1229A	GREY	TR

Set #12

Doors: 110, 111

3	Heavy Duty Full Mortise Hinge	FBF168 4.5" x 4.5"	26D	ST
1	Lockset-Classroom	45H-7R15H PATD	626AM	BE
1	Closer w/ Spring Stop	8916 S-DS	689	DM
1	Kick Plate	K0050 8" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WV	630	TR
1	Perimeter Gaskets	2525 C x LAR		NA
3	Silencer	1229A	GREY	TR

Set #13

Doors: 128

3	Heavy Duty Full Mortise Hinge	FBF168 4.5" x 4.5"	26D	ST
1	Lockset-Classroom	45H-7R15H PATD	626AM	BE

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1	Closer w/ Stop & Hold	8916 ISH	689	DM
1	Kick Plate	K0050 8" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1	Perimeter Gaskets	2525 C x LAR		NA
3	Silencer	1229A	GREY	TR

Set #14

Doors: 105, 116

3	Std Duty Full Mortise Hinge	FBF179 4.5" x 4.5"	26D	ST
1	Lockset-Storeroom	45H-7D15H PATD	626AM	BE
1	Wall Bumper	1270WV	630	TR
3	Silencer	1229A	GREY	TR

Set #15

Doors: 117

3	Std Duty Full Mortise Hinge	FBF179 4.5" x 4.5"	26D	ST
1	Lockset-Storeroom	45H-7D15H PATD	626AM	BE
1	Wall Bumper	1270WV	630	TR
3	Silencer	1229A	GREY	TR

Set #16

Doors: 132

3	Std Duty Full Mortise Hinge	FBF179 4.5" x 4.5"	26D	ST
1	Lockset-Storeroom	45H-7D15H PATD	626AM	BE
1	Closer w/ Spring Stop	8916 S-DS	689	DM
1	Kick Plate	K0050 8" x 2" LDW B4E CSK	630	TR
3	Silencer	1229A	GREY	TR

Set #17

Doors: 119

6	Std Duty Full Mortise Hinge	FBF179 4.5" x 4.5"	26D	ST
2	Manual Flushbolt	3916 x 12" (Install at top of Inactive Leaf)	626	TR
1	Lockset-Storeroom	45H-7D15H PATD	626AM	BE
2	Kick Plate	K0050 8" x 1" LDW B4E CSK	630	TR
2	Wall Bumper	1270WV	630	TR
2	Silencer	1229A	GREY	TR

Set #18

Doors: 124

6	Std Duty Full Mortise Hinge	FBF179 4.5" x 4.5"	26D	ST
1	Manual Flushbolt	3916 x 12"	626	TR
1	Lockset-Storeroom	45H-7D15H PATD	626AM	BE
2	Armor Plate	KA050 30" x 35" B4E-HEAVY-AP CSK-AP		
		UL Rated - Stamp	630	TR
2	Silencer	1229A	GREY	TR

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Set #19

Doors: 122

2	Continuous Hinge	HD1100A 83"		NA
2	Manual Flushbolt	3917-12	626	TR
1	Lockset-Storeroom w/ Deadbolt	45H-7TD15H PATD	630AM	BE
2	Closer w/ Stop & Hold	8916 DST	689	DM
2	Kick Plate	K0050 8" x 1" LDW B4E CSK	630	TR
1	Perimeter Gaskets	2525 C x LAR		NA
2	Door Sweep	101 VA x LAR		NA
1	Drip Cap	16 A - +4" ODW		NA
1	Threshold	896 S x LAR	AL	NA
2	Silencer	1229A	GREY	TR

Set #20

Doors: 107, 126

3	Std Duty Full Mortise Hinge	FBF179 4.5" x 4.5"	26D	ST
1	Privacy Set w/ Indicator	45H-0L15H VIB	626AM	BE
1	Closer w/ Stop	8916 IS	689	DM
1	Kick Plate	K0050 8" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1	Wall Bumper	1270WV	630	TR
1	Coat Hook	3072	630	TR
1	Perimeter Gasketing	2525 C x LAR		NA
3	Silencer	1229A	GREY	TR

Set #21

Doors: 114, 115, 115A

1	Continuous Hinge	HD1100A 83"		NA
1	Push/Pull Bar Set	1738 36"	710CU	TR
1	Closer w/ Spring Stop	8916 S-DS	689	DM
1	Wall Bumper	1270WV (@ Dr. #114)	630	TR
1	Perimeter Gaskets	By Aluminum Door Manufacturer		BY

Set #22

Doors: 120

2	Continuous Hinge	HD1100A 83"		NA
2	Push/Pull Bar Set	1738 36"	710CU	TR
2	Closer w/ Spring Stop	8916 S-DS	689	DM
1	Perimeter Gaskets	By Aluminum Door Manufacturer		BY

Set #23

Doors: 129

2	Continuous Hinge	HD1100A 83"		NA
2	Push-Pull Bar Set	1747 36"	710CU	TR
2	Closer w/ Spring Stop	8916 S-DS	689	DM
1	Perimeter Gaskets	By Aluminum Door Manufacturer		BY

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Set #24

Doors: 131, 133

3	Heavy Duty Full Mortise Hinge	FBF168 4.5" x 4.5"	26D	ST
1	Push Plate	1001-9	710CU	TR
1	Hospital Pull	1135	710CU	TR
1	Kick Plate	K0050 8" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1	Wall Bumper	1270WV	630	TR
1	Perimeter Gasketing	2525 C x LAR		NA
3	Silencer	1229A	GREY	TR

Opening List

<u>Opening</u>	<u>Hdw Set</u>
100	01
100A	05
101	08
102	09
103	11
104	10
105	14
107	20
109	04
110	12
111	12
112	09
113	09
114	21
115	21
115A	21
116	14
117	15
118	02
119	17
120	22
121	06
121A	06
122	19
123	07
124	18
125	02
126	20
127	09
128	13
129	23
130	03
131	24
132	16
133	24

END OF SECTION

SECTION 08800 - GLASS AND GLAZING

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

- A. Extent of glass and glazing work is indicated on Drawings and Schedules.
- B. Types of work in this section include glass and glazing for:
 - (1) Glazing for Exterior Aluminum Storefront Window Systems, including internal Muntin Grids sealed between insulating glass, where shown and scheduled on Drawings.
 - (3) Glazing for Exterior Aluminum Entrance Doors and Transoms, including internal Muntin Grids sealed between insulating glass, where shown and scheduled on Drawings.
- C. Related Sections:
 - (1) Exterior Aluminum Storefront Window Systems, Entrance Doors and Transoms are specified in Section 08411.
 - (2) Mirrors are specified in Division 8 Section 08830 "Mirrors & Accessories".

1.03 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in construction.

1.04 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each glass product and glazing material indicated.
- C. Samples for verification purposes of 12-inch-square samples of each type of glass indicated, and 12-inch-long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.
- D. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.
 - (1) Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass,

provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

1.05 QUALITY ASSURANCE

- A. Glazing Standards: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - (1) FGMA Publications: FGMA Glazing Manual
 - (2) SIGMA Publications: TM-3000 Vertical Glazing Guidelines
- B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
 - (1) *Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SCGG) or other certification agency acceptable to authorities having jurisdiction.*
- C. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.
- D. Single-Source Responsibility for Glass: Obtain glass from one source for each project indicated below:
 - (1) Primary glass of each (ASTM C 1036) type and class indicated.
 - (2) Heat-treated glass of each (ASTM C 1048) condition indicated.
 - (3) Insulating glass of each construction indicated.
- E. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials to comply with manufacturer=s directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
 - (1) Where insulating glass units will be exposed to substantial altitude changes, comply with insulating glass fabricator=s recommendations for venting and sealing to avoid hermetic seal ruptures.

1.07 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.08 WARRANTY

- A. Manufacturer's Warranty on Insulating Glass: Submit written warranty signed by manufacturers of insulating glass agreeing to furnish replacements for insulating glass units that deteriorate within specified warranty period indicated below. Warranty covers

only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer=s published instructions.

- (1) **Warranty Period: Manufacturer's standard but not less than 10 years after date of Substantial Completion.**

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the products specified in Product Data Sheets at end of this Section.

2.02 HEAT-TREATED FLOAT GLASS PRODUCTS, GENERAL

- A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

B. HEAT-TREATED FLOAT GLASS

- (1) Uncoated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality z3 (glazing select), kind as indicated below.

- (a) Kind FT (fully tempered) where indicated.

- (2) Available Manufacturers: Subject to compliance with requirements, manufacturers offering heat-treated glass products that may be incorporated in the Work include, but are not limited to, the following companies.

AFG Industries, Inc.
Cardinal IG.
Saint-Gobain
Guardian Industries Corp.
HGP Industries
PPG Industries, Inc.
Viracon, Inc.

2.03 INSULATING GLASS PRODUCTS

- A. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements indicated, including those in Insulating Glass Product Data Sheet at the end of this Section.

- (1) Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulating glass products that may be incorporated in the Work include, but are not limited to, the following companies.

AFG Industries, Inc.
Cardinal IG.
Saint-Gobain
Guardian Industries Corp.

HGP Industries
PPG Industries, Inc.
Viracon, Inc.

- (2) For properties of individual glass lites making up units, refer to requirements specified elsewhere in this Section applicable to types, classes, kinds, and conditions of glass products comprising lites of insulating glass units.
- (3) Provide heat-treated, clear float glass of kind indicated or, if not otherwise indicated, Kind FT (fully tempered) where safety glass is designated or required.
- (4) Interior Muntin (Grids): Where indicated and scheduled on the Drawings, provide interior "between the glass" muntin grids sealed between insulating glass lites, as follows:
 - (a) Interior aluminum roll-formed flat muntin grids, fabricated in patterns (number of lites) as shown on Drawings at each window, door or transom type.
 - (b) Grid Size: Nominal 5/8" wide x 1/8" thick. Note: Grid thickness shall be set as required to prevent grids from contacting any interior glass surfaces with "Low-E" coating.
 - (c) Grid Color: Match color and finish of aluminum frames or doors where grids are indicated.

2.04 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - (1) Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will 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.
 - (2) Suitability: Comply with sealant and glass manufacturer=s recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
 - (3) Colors: Provide color of exposed joint sealants to comply with the following:
 - a. Provide selections made by Architect from manufacturer=s full range of standard of colors for products of type indicated.
- B. Elastomeric Glazing Sealant Standard: Provide manufacturer=s standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements indicated on each Elastomeric Glazing Sealant Product Data Sheet at the end of this Section, including those referencing ASTM classifications for Type, Grade, Class and Uses.
 - (1) Additional Movement Capability: Where additional movement capability is specified in Elastomeric Glazing Sealant Product Data Sheet, provide products, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, with the capability to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

2.05 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, non-staining and nonmigrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:
- (1) AAMA 804.1.
 - (2) AAMA 806.1.
- B. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.
- C. Available Products: Subject to compliance with requirements, glazing tape that may be incorporated in the Work include, but is not limited to, the following:
- (1) Back-Bedding Mastic Glazing Tape Without Spacer Rod:
 - a. PTI 393 Glazing Tape (shimless), Protective Treatments, Inc.
 - b. S-M 5700 Poly-Glaze Tape Sealant, Schnee-Morehead, Inc.
 - c. Tremco 440 Tape, Tremco Inc.
 - d. Dyna-Seal, Pecora Corp.
 - e. PTI 626 Architectural Sealant Tape, Protective Treatments, Inc.
 - f. S-M 5710 H.P Poly-Glaze Tape Sealant, Schnee-Morehead, Inc.
 - g. SST-800 Tape, Tremco, Inc.
 - (2) Back-Bedding Mastic Glazing Tape With Spacer Rod:
 - a. PTI 303 Glazing Tape (with shim). Protective Treatments, Inc.
 - b. Pre-shimmed Tremco 440 Tape, Tremco. Inc.
 - c. PTI 606 Architectural Sealant Tape, Protective Treatments, Inc.
 - (3) Expanded Cellular Glazing Tape:
 - a. Norseal V-980 Closed-Cell Glazing Tape, Norton Company.

2.06 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
- (1) Neoprene, ASTM C 864.
 - (2) EPDM. ASTM C 864.
 - (3) Silicone, ASTM C 1115.
 - (4) Thermoplastic polyolefin rubber, ASTM C 1115.
- B. Soft Compression Gaskets: Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:
- (1) Neoprene
 - (2) EPDM
 - (3) Silicone
 - (4) Thermoplastic polyolefin rubber.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following companies.

- (1) Preformed Gaskets:
Advanced Elastomer Systems, L.P.
Schnee-Morehead, Inc.
Tremco, Inc.

2.07 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).
- F. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonextruding, nonoutgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.

2.08 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Examine glass framing, with glazier present, for compliance with the following:
 - (1) Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
 - (2) Presence and functioning of weep system.
 - (3) Minimum required face or edge clearances.
 - (4) Effective sealing between joints of glass-framing members.
- B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.03 GLAZING, GENERAL

- A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass from edge damage during handling and installation as follows:
 - (1) Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer=s label.
 - (2) Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install elastomeric settings blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:
 - (1) Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.
 - (2) Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.
- I. Set glass lites in each series with uniform pattern, draw, bow and similar characteristics.

3.04 TAPE GLAZING

- A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sight line of stops.
- B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.

- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by manufacturer.
- E. Do not remove release paper from tape until just before each lite is installed.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit opening s exactly, with stretch allowance during installation.
- B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- C. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

- A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposes surfaces of sealants to provide a substantial wash away from glass. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.07 PROTECTION AND CLEANING

- A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for

build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.
- E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.08 PRODUCT DATA

A. Primary (Clear) Float Glass Product Data

- (1) Primary (Clear) Float Glass Designation: See "Schedule of Glazing Types"
- (2) Class: (Class 1 (clear) float glass.)

B. Type "B" Insulating Glass Product Data

- (1) Insulating Glass Unit Designation: See "Schedule of Glazing Types".
- (2) Classification of Units: Class CBA per ASTM E 774.
- (3) Air Space Width: Nominal 2 inch measured perpendicularly from surfaces of glass lites at unit's edge.
- (4) Sealing System: Dual seal, primary and secondary sealants: (manufacturer=s standard sealants).
- (5) Spacer Specifications: Manufacturer's standard metal.
 - a. Dessicant: Either molecular sieve or silica gel or blend of both.
 - b. Corner Construction: Manufacturer=s standard corner construction.
- (6) Glass Specifications: Comply with the following requirements.
 - a. Thickness of Each Lite: 6.0 mm (0.23 inch)
 - b. Uncoated Indoor Lite: Class 1 (clear) float glass. Kind FT (fully tempered), where scheduled. Condition A (uncoated), Class 1 (clear) float glass.
 - c. Outdoor Lite: TI-AC40 Low-E Coating: Where scheduled - Kind FT (fully tempered).

C. Type "C" Insulating Glass Product Data

- (1) Insulating Glass Unit Designation: Low-E Ultra Clear Insulating Glass; Clear, low-reflective outdoor appearance.
- (2) Product: Equal to "Solarban®" 72(2) "Starphire®" + Starphire by PPG Industries, Inc. Kind FT (fully tempered).
- (3) Insulating Unit Construction: 1/4-inch (6mm) "Starphire" Glass, "Solarban" 72 Solar Control (Sputtered) on second surface (2) + 1/2-inch (13mm) air space + 1/4-inch (6mm) "Starphire" (ultra-clear) Glass.
- (4) Performance Values:
 - (a) Visible Light Transmission: 71 percent
 - (b) SHGC: 0.30
 - (c) Shading Coefficient: 0.34
 - (d) Outdoor Visible Light Reflectance: 12 percent

- (e) Heat Transfer Coefficient:
 - Winter U-Value: 0.29
 - Summer U-Value: 0.27

D. Elastomeric Glazing Sealant Product Data

- (1) Base Polymer: Urethane.
- (2) Type: S (single component).
- (3) Grade: NS (non-sag).
- (4) Uses Related to Exposure: T (traffic) and NT (nontraffic).

END OF SECTION 08800

SECTION 09250 – GYPSUM DRYWALL

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division – 1 General Requirements sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

- A. Types of work include:
 - (1) Gypsum drywall.
 - (2) Interior non-load bearing metal stud and furring systems.
 - (3) Sound attenuation insulation.
 - (4) Drywall finishing (joint tape and compound treatment).
 - (5) Tile backing panels at wainscot locations and stone at fireplaces.

Related Work specified in other sections:

- (1) Exterior metal wall studs and sheathing are specified in Division 5, Section 05400.
- (2) Wood framing, blocking and trim are specified in Division 6 Sections.
- (3) Exterior Insulation and Finish System is specified in Division 7, Section 07240.
- (4) Blanket-type Thermal Building Insulation is specified in Division 7, Section 07210.
- (5) Division 15 Mechanical Sections.
- (6) Division 16 Electrical Sections.

1.03 QUALITY ASSURANCE

- A. Gypsum Board Standard: GA-216 by Gypsum Association.
- B. Metal Support Standard: ASTM C 754.
- C. Manufacturer: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.
- D. Allowable Tolerances: 1/8" offsets between planes of board faces and 1/4" in 8'-0" for plumb, level, warp and bow.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions for each gypsum drywall component, including other data as may be required to show compliance with these specifications.

1.05 PRODUCT HANDLING

- A. Deliver, identify, store and protect gypsum drywall materials to comply with referenced standards.

1.06 JOB CONDITIONS

- A. Environmental Conditions: Comply with referenced standards.

1.08 COORDINATION OF WORK

- A. Coordinate drywall furring work with installers of related work including, but not limited to acoustical ceilings, building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, sprayed-on fireproofing and sprinklers.
- B. All work above the ceiling line should be completed prior to installing the drywall sheet goods. There should be no materials resting against or wrapped around the suspension system, hanger wires or ties

PART II – PRODUCTS

2.01 METAL SUPPORT MATERIALS

A. Interior Wall/Partition Support Materials:

- (1) Drywall Studs: ASTM C645; 20-gauge unless otherwise indicated on Drawings.
- (a) Depth of Section: Generally, 3-5/8" deep (except as indicated on Drawings as 2-1/2" deep or 6" deep at Chase Walls, Column Furring, Steel Beams and other locations) with 1-1/4" flange and flange return lip.
- (b) Products as manufactured by Dietrich Metal Framing; a Worthington Industries Company; MarinoWare; a division of Ware Industries; Southeastern Stud & Components, Inc.; Unimast, Incorporated (USG), or equal.
- (c) Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.
- (d) Stud system accessories: Provide stud manufacturer's standard clips, shoes, ties, reinforcements, fasteners and other accessories as needed for a complete stud system.
- (e) Built-up Headers: Size, gauge and configuration as indicated on Drawings.
- (2) Furring Members ASTM C 645; 20-gauge, hat-shaped, 7/8" deep.

2.02 GYPSUM BOARD PRODUCTS

- A. Gypsum Board (GypBd): (Also known as gypsum wallboard). ASTM C630 with tapered long edges. Type "X" as referenced on Drawings.
- (1) Thickness 5/8"
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- (1) American Gypsum Co.
- (2) G-P Gypsum

- (3) LaFarge North America, Inc.
- (4) National Gypsum Company
- (5) Temple
- (6) USG Corporation

C. Type X:

- (1) Thickness: 5/8". Comply with GA-216 for each application and support spacing.
- (2) Long Edges: Tapered

D. Provide moisture resistant gypsum backing board at all locations where porcelain tile wainscot or LedgeStone finish is scheduled over gypsum board.

E. Thicknesses: As indicated above or, where not otherwise indicated, comply with thickness requirements of GA-216 for each application and support spacing. Comply with requirements for U.L. fire-resistance ratings indicated.

F. Sheet Size: Maximum length available which will minimize joints.

2.03 TRIM ACCESSORIES

A. General: Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or 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.

2.04 JOINT TREATMENT MATERIALS

A. General: ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.

B. Joint Tape: Interior Gypsum Wallboard: Paper.

C. Joint Compound: On interior work provide chemical hardening type for bedding and filling, ready-mixed vinyl type or vinyl type powder type for topping.

2.05 AUXILIARY MATERIALS

A. General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.

B. Laminating Adhesive: Special adhesive or joint compound specifically recommended for laminating gypsum boards.

C. Gypsum Board Fasteners: Steel Drill Screws, complying with ASTM C1002, unless otherwise indicated.

- (1) Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033" to 0.112" thick.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag, wool or rock wool; 3-1/2" unless indicated otherwise.

- (1) Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly, where applicable.
- (2) Provide Sound Attenuation Blankets at where indicated on Drawings at interior drywall partitions. SEE FLOOR PLAN LEGEND ON DRAWINGS.

PART III – EXECUTION

3.01 INSTALLATION OF METAL SUPPORT SYSTEMS

A. Wall/Partition Support Systems:

- (1) Install supplementary framing, blocking, furring and bracing at openings and terminations in the work; and at locations as required to support fixtures, equipment, services, heavy trim, casework, millwork, furnishings and similar work which cannot be adequately supported on gypsum board alone.
- (2) Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
- (3) Install runner tracks at floors, ceilings and structural walls, beams and columns where gypsum drywall stud system abuts other work, except as otherwise indicated.
- (4) Extend partition stud system through acoustical ceilings and elsewhere as indicated to the structural support or substrate above the ceiling.
- (5) Space studs and joists at 24" o.c. except as otherwise indicated.
- (6) Frame door openings with vertical studs securely attached by screws at each jamb either directly to frames or to jamb anchor clips on door frame; install runner track sections (for jack studs) at head and secure to jamb studs.
 - (a) Provide runner tracks of same gauge as jamb studs. Space jack studs same as partition studs.
 - (b) Install 20 gauge studs at each jamb for all doors 2'-8" wide to 4'-0" wide weighing not more than 200 lbs.; and for all doors less than 2'-8" wide weighing more than 100 lbs. But not more than 200 lbs.
 - (c) Install double 20 gauge studs placed back to back at each jamb for pairs of doors over 4'-0" wide weighing not more than 300 lbs.; screw attach web of back to back studs direct to jamb anchor clips nested between flange of stud.
- (7) Frame openings other than door openings in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.
- (8) Space furring members 24" o.c., except as otherwise indicated.

3.02 GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS

- A. Install sound attenuation blankets as indicated, prior to gypsum board unless readily installed after board has been installed.
- B. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 1'-0" in alternate courses of board.
- C. Install wall/partition boards vertically to avoid end-butt joints wherever possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.

- D. 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 1-1/6" open space between boards. Do not force into place.
- E. 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 both tapered edge joints abut, and mill-cut or field-cut end joints abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
- F. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.
- G. Unless indicated otherwise, cover both faces of stud partition framing with gypsum board in concealed spaces (above ceilings, etc.) except in chase walls which are properly braced internally.
 - (1) Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage.
- H. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4" to 1/2" space and trim edge with J-type semi-finishing edge trim. Seal joints with acoustical sealant. Do not fasten drywall directly to stud system runner tracks.
- I. Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum board with "floating" internal corner construction, unless isolation of the intersecting boards is indicated, unless control or expansion joints are indicated, or unless fire rating is indicated.
- J. Where sound-rated drywall work is indicated (STC rating), including double-layer work and work on resilient furring, seal the work 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 manufacturer's recommendations for location of beads, and close off sound-flanking paths around or through the work, including sealing of partitions above acoustical ceiling.
- K. Space fasteners in gypsum boards in accordance with referenced standards, U.L. Design requirements, and with manufacturer's recommendations, unless otherwise indicated.

3.03 METHODS OF GYPSUM DRYWALL APPLICATION

- A. Single-layer and double layer application: Install exposed gypsum board as follows.
 - (1) On partitions/walls apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.
- B. Single-layer and double layer fastening methods: Apply gypsum board to supports as follows:
 - (1) Fasten with screws.

3.04 INSTALLATION OF SUSPENSION SYSTEMS – GENERAL

- A. Install suspension system in accordance with the manufacturer's instructions, in compliance with ASTM installation standard, and with applicable codes as required by the authorities having jurisdiction.
- B. To secure to metal clips, concrete inserts, steel bar joist, steel beam or steel deck, use power actuated fastener or insert. Coordinate placement for hanger wire spaced as required for expected ceiling loads and layout.
- C. Install hanger wire as required with necessary on center spacing to support expected ceiling load requirements, following local practices, codes and regulations. Provide additional wires at light fixtures. A pigtail knot shall be used with three tight wraps at top and bottom fastening locations.
- D. Add additional wire as needed when using compatible clips and accessories.
- E. Control and Expansion Joints: Roll formed zinc alloy, aluminum, or plastic as required for expansion and contraction.
- F. Main beams shall be suspended from the overhead construction with hanger wire, spaced as required for expected ceiling loads, along the length of the main beams.
- G. Install cross tees at on center spacing as specified by the drywall manufacturer.
- H. Use channel molding or angle molding to interface with Drywall Grid System to provide perimeter attachment or to obtain drop soffits, verticals, slopes, etc.
- I. For light fixtures use secondary framing cross tees as required to frame opening.
- J. Single cross tees in a route hole to be secured by 7/16-inch framing screw or alternative methods.

3.05. INSTALLATION OF DRYWALL TRIM ACCESSORIES

- A. General: Where feasible use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.
- B. Install metal corner beads at external corners of drywall work.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant filled (including expansion joints). Install where gypsum board abuts masonry.
- D. Install J-type semi-finishing trim where indicated and where exterior gypsum board edges are not covered by applied moldings.
- E. Install metal control joint (beaded-type) where indicated (G.C.J.).

3.06 INSTALLATION OF DRYWALL FINISHING

- A. General: Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for decoration. Prefill open joints and rounded or beveled edges, using type of compound recommended by manufacturer.
- (1) Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated.
 - (2) Apply joint compound in 3 coats (not including prefill or openings in base) and sand between last 2 coats and after last coat.

3.07 ADJUST AND CLEAN

- A. Screw pop:
- (1) Repair screw pop by installing new screw approximately 1-1/2" from pop and reseal.
 - (2) When face paper is punctured, install new screw approximately six months after installation or one heating season.
 - (3) Fill damaged surface with compound.
- B. Ridging:
- (1) Do not repair ridging until condition has fully developed: Approximately six months after installation or one heating season.
 - (2) Sand ridges to reinforcing tape without cutting through tape.
 - (3) Fill concave areas on both sides of ridges with topping compound.
 - (4) After fill is dry, blend in topping compound over repaired area.
- C. Fill cracks with compound and finish smooth and flush.

3.08 PROTECTION OF WORK

- A. Installer shall advise Contractor of required procedures for protecting gypsum drywall work from damage and deterioration during remainder of construction period.

END OF SECTION 09250

SECTION 09310 - TILEPART 1 - GENERAL1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of tile work is indicated on drawings.
- B. Types of tile work in this section include the following:
 - (1) Interior Glazed Porcelain Floor, Base, Wainscot and Wall Tile, where indicated and scheduled on Drawings.
 - (2) Unglazed quarry floor and base tile.
 - (3) Thin-set Ledgerstone fireplace facing.
 - (3) Metal transition strips at porcelain tile, where indicated on drawings.
- C. Gypsum drywall substrates are specified in Section 09250.

1.03 QUALITY ASSURANCE

- A. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

1.04 SUBMITTALS

- A. Samples for Initial Selection Purposes: Submit manufacturer's stock color samples consisting of actual tiles or sections of tile showing full range of colors, textures and patterns available for each type of tile indicated. Include samples of grout and accessories involving color selection, where necessary.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.

1.06 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.
- C. Maintain temperatures at not less than 50 deg. F (10 deg. C) in tiles areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

1.07 EXTRA MATERIALS

- A. 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.
- (1) Tile and Trim Units: Furnish quantity of full-size units equal to 2 percent of amount installed, for each type, composition, color, pattern and size.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
- (1) Manufacturers of Unglazed Quarry Tile Floor & Base:
American Olean Tile Co., Inc.
Dal-Tile Corp.
Florida Tile Industries, Inc.
Summitville Tile, Inc.
- (2). Porcelain Tile and Trim: The following performance specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding, but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this section. Equal products by Dal-Tile and other manufacturers will be considered, subject to submission in accordance with the Prior Approval section of these specifications.
- (a). Available Manufacturer-Basis of Design: The following porcelain tile manufacturer and product has been accorded prior approval:
- FLORIM USA – “Stonefire” Glazed Porcelain Tile
- (3) Ledgerstone veneer:
- (a). Available Manufacturer-Basis of Design: The following thin set stone veneer manufacturer and product has been accorded prior approval:
- Anatolia

2.02 PRODUCTS, GENERAL

- A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated.
- (1) Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.
- B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.
- C. Colors, Textures and Patterns: For tile, grout and other products requiring selection of colors, surface textures or other appearance characteristics, provide products as

selected by Architect from manufacturer's standard color range for new glazed tile, and as follows:

- (1) Interior Tile: See Drawings and Schedules on Drawings for specific locations of interior porcelain floor and wall tile.

- D. Slip-Resistance: Provide unglazed ceramic and porcelain floor tiles with a coefficient of Friction (wet and dry value) of 0.6 or above, per recommendations of the Americans with Disabilities Act (ADA).

2.03 TILE PRODUCTS

- A. Porcelain Floor, Wainscot and Wall Tile: Provide flat tile complying with the following requirements:

- (1) Nominal Facial Dimension: 12" x 12" (refer to drawings for locations).
- (2) Nominal Thickness: 3/8" (10mm).
- (3) Product: Equal to FLORIM USA, "Stonefire"
- (4) Color by Architect

- B. Porcelain Tile Bullnose Cap Trim for Base and Wainscots, where shown on Drawings: Provide flat tile complying with the following requirements:

- (1) Nominal Facial Dimension: 3" x 12" (refer to drawings for locations).
- (2) Nominal Thickness: 3/8" (10mm).
- (3) Product: Equal to FLORIM USA "Stonefire"
- (4) Color by Architect.

- C. Unglazed Quarry Tile: Provide square - edge flat tile complying with the following requirements.

- (1) Wearing Surface: Equal to American Olean "Quarry Naturals" quarry tile.
- (2) Nominal and Facial Dimensions: 8" x 8".
- (3) Nominal Thickness: 1/2".
- (4) Base Trim Pieces: Nominal 5" high x 6" wide x 1/2" thick. Cove with bullnose top; surface bullnose at external corners; coved internal corners.
- (5) Color by Architect

2.04 CRACK SUPPRESSION MEMBRANE FOR THINSET TILE INSTALLATION

- A. Crack Suppression Membrane to be thin, cold applied, single component liquid and load bearing. Reinforcing fabric to be non-woven rot-proof specifically intended for crack suppression membrane. Materials to be non-toxic, non-flammable, and non-hazardous during storage, mixing, application and when cured. Crack Suppression Membrane shall also meet the following physical requirements:

1. Elongation at break (ASTM D751): 20 - 30%
2. Service Temperatures (LIL 1016): -20 deg to 280 deg F (-28 deg to 137 deg. C)
3. Breaking Strength (ASTM D751): 1700 psi (11.7 MPa)
4. Thickness (LIL 1013): 20 mils (0.5 mm)
5. Service Rating (TCA/ASTM C627): Extra heavy/cycles 1-14

- B. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:

- (1) "Laticrete Blue 92" Anti-Fracture Membrane; Laticrete International, Inc.

2.05 SETTING MATERIALS

- A. Mortar Bed: Portland Cement Mortar; ANSI A108.1A.
- B. Bond Coat: Dry-Set mortar or latex-portland cement mortar on cured bed; ANSI A108.5.
- C. Dry-Set Mortar: Provide product complying with ANSI A118.1.
- D. Latex-Portland Cement Mortar: Provide product complying with ANSI A118.4 and the following requirement for composition:
 - (1) Prepackaged dry mortar mix incorporating dry polymer additive in the form of a re-emulsifiable powder to which only water is added at job site.
 - (2) Latex additive (water emulsion) of type described below, serving as a replacement for part or all of gauging water, added at job site to prepackaged dry mortar mix supplied or specified by latex manufacturer.
 - (a) Latex Type: Manufacturer's standard.

2.06 GROUTING MATERIALS

- A. Commercial Latex Portland Cement Grout: Provide product complying with ANSI A118.
- B. Chemical-Resistant Epoxy Grout Quarry Tile only. Provide product complying with ANSI A108.6

2.07 MISCELLANEOUS MATERIALS

- A. 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.
- B. Primers: As recommended by tile manufacturer for types of substrate to receive tile.

2.08 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers for accurately proportioning of materials, water or additive content, mixing equipment and mixer speeds, mixing containers, mixing time, and other procedures need to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

2.09 MANUFACTURED COMPONENTS AND ACCESSORIES

- A. Tile Edge and Transition Strips: Roll-formed stainless-steel transition strips; profile and height as indicated; with integral perforated anchoring leg for setting the strip into setting material.
 - 1. Profile: Sloped transition strip; compliant with Americans with Disabilities Act (ADA).
 - 2. Height: As required to suit application.
 - 3. Material and Finish:
 - a. Brushed stainless steel: EGB
 - 4. Products:
 - a. Tile to Lower Finish: Schluter - RENO-U.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard.

3.02 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standard: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile".
- B. TCNA Installation Guidelines: TCNA "Handbook for Ceramic Tile Installation" (latest Edition); comply with TCNA installation methods indicated or, if not otherwise indicated, as applicable to installation conditions shown.
- C. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners with disrupting pattern or joint alignments.
- D. 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.
- E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown.
- F. Expansion Joints: Locate expansion joints and other sealant filled joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation tiles.
- (1) Locate joints in tile surfaces directly above joints in concrete substrates.
 - (2) Comply with expansion joint recommendations of current TCNA Handbook.
- G. Grout tile to comply with the requirements of the following installation standards:
- (1) For ceramic and porcelain tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts) comply with ANSI A108.10.
 - (2) For chemical-resistant epoxy grouts, comply with ANSI A108.6.

3.03 FLOOR INSTALLATION METHODS

- A. Quarry Tile: Install tile to comply with requirements indicated below for setting bed method, TCNA installation method related to type of subfloor construction, and grout type.
- (1) Portland Cement Mortar: ANSI A108.1
 - (2) Substrate: Concrete Subfloors, Interior: TCNA F112-98 (bonded).
 - (3) Grout: Chemical-resistant epoxy at floors of Food Service areas only.
 - (4) Commercial latex portland cement elsewhere.

B. Crack Suppression (Spot Treatment of Cracks):

- (1) Crack suppression must be applied a minimum of 3 times the width of the tile or stone being installed or the tile being set over the crack must be completely over the crack suppression membrane. The tile over the crack cannot be in contact with the concrete. Install anti-fracture membrane in compliance with current revisions of ANSI A108.1 (A-1 through A-3). Review the installation and plan the application sequence. Pre-cut Anti-Fracture Membrane Reinforcing Fabric, allowing 2" (50 mm) for overlap at ends and sides. Roll-up the pieces for easy handling and placement. Shake or stir Anti-Fracture Membrane Liquid before using. Pre-treat all substrate cracks, cold joints, control joints, coves, corners and penetrations according to Manufacturer's specific recommendations. Allow pre-treated areas to dry to the touch. Apply a liberal coat of Anti-Fracture Membrane Liquid with brush or roller over substrate including pre-treated areas. Before the coat dries, unroll Anti-Fracture membrane Reinforcing Fabric, smooth out any wrinkles and press with brush or roller until Anti-Fracture Membrane Liquid "bleeds" through to surface. Apply another liberal coat of Anti-Fracture Membrane Liquid and allow it to dry to the touch - 1-3 hours @ 70 deg. F (21 deg. C) & 50% RH. For installation of ceramic tile, mosaic, paver, brick or stone, follow **Thin Bed Method** (3.4 C.), which may begin as soon as last coat of Anti-Fracture Membrane Liquid has dried to the touch. Allow Anti-Fracture Membrane to cure for at least 3 days @ 70 deg. F (21 deg. C) & 50% RH before exposing installation to rain or other water, even if covered by ceramic tile, mosaics, pavers, brick or stone.

3.04 WALL TILE INSTALLATION METHODS

- A. Install types of tile designated for wall application to comply with requirements indicated below for setting bed methods, TCNA installation methods related to subsurface wall conditions, and grout types:
- B. Latex-Portland Cement Mortar: ANSI A108.5.
- C. Dry-Set Mortar: ANSI A108.5.
- D. Substrate:
 - (1) Gypsum Board, Interior: TCNA W243-05.
 - (2) CMU Masonry, Interior: TCNA W202-05.
 - (3) Grout: Commercial latex portland cement.

3.05 CLEANING AND PROTECTION

- A. Cleaning: Upon completion of placement and grouting, clean all tile surfaces so they are free of foreign matter.
 - (1) Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but not 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.
- B. Finish Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective tile work.
- C. Protection: 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.

- D. Prohibit foot and wheel traffic when using tiled floors for at least 7 days after grouting is completed.
- E. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09310

SECTION 09511 - LAY-IN CEILINGSPART 1 - GENERAL1.01 GENERAL

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

- A. Types of lay-in ceilings specified include the following:
- (1) Non-fire resistance rated lay-in ceilings:
- a. Non-directional type, angled tegular edge lay-in mineral fiber panel ceilings in exposed steel grid, as scheduled on Drawings.
 - b. Non-directional type, square-edge lay-in mineral fiber panel ceilings in exposed steel grid, as scheduled on Drawings.
 - c. Square-edge lay-in vinyl-faced gypsum board ceilings in exposed steel grid with "white" aluminum grid cap, as scheduled on Drawings.
- B. Related Section: See Electrical Drawings and Specifications for new light fixture locations, and fixture support requirements.
- C. Related Section: See Mechanical Drawings and Specifications for grilles, registers and diffusers in lay-in ceilings.

1.03 SUBMITTALS

- A. Product data: Submit manufacturer's technical data for each type of lay-in ceiling unit and suspension system required.
- B. Samples: Submit manufacturer's standard size samples of acoustical units, but not less than 6" square, and of exposed ceiling suspension members including wall and special moldings. Provide samples showing full range of colors, textures and patterns available for each type of component required.
- C. Certificates: Submit certificates from testing laboratories attesting that acoustical ceiling products comply with specification requirements.

1.04 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide ceiling components that are identical to those tested for the following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspection agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspection agency.
- (1) Surface Burning Characteristics: As follows, tested per ASTM E 84.

- (a) Flame spread: 25 or less.
- (b) Smoke developed: 50 or less.

1.05 SYSTEMS DESIGN CRITERIA

- A. Structural Criteria: Suspension system including all its components, hangers and fastening devices shall be capable of supporting lighting fixtures, ceiling grilles and lay-in units without deflecting more than 1/360 of span when tested as a simple beam-end free center reading.

1.06 COORDINATION OF WORK

- A. Coordinate layout and installation of ceiling units and suspension system components with other work supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components, and partition systems. Centerlines for ceiling system shall be established and maintained by Contractor. All trades shall work to these lines.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver 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 or other causes.
- B. Before installing ceiling units, permit them to reach room temperature and to have stabilized moisture content.
- C. Handle ceiling units carefully to avoid chipping edges or damaging units in any way.

1.08 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials described below matching products installed, packaged with protective covering for storage and identified with appropriate labels. Lay-in ceiling units: Furnish quantity of full size units equal to 2.0% of amount installed.

1.09 GUARANTEE

- A. All materials and workmanship furnished under this section of the specifications shall be guaranteed in writing for a **period of ten (10) years from date of acceptance of the building** and any defective materials or workmanship shall be replaced during this period without cost to the Owner.

PART 2 - PRODUCTS

2.01 ACOUSTICAL PANELS

- A. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include but are not limited to the following:
 - (1) Armstrong World Industries.
 - (2) BPB America Inc.
 - (3) USG Acoustical Products Co.

B. Angled Tegular Edge Acoustical Panels at Non-Fire-Resistance-Rated Ceilings:

- (1) To establish minimum design and quality standards, Type 1 acoustical panels shall be non-directional type, angled tegular edge, equal to Armstrong Tegular Cortega **No. 704** (24"x24"x 5/8").

(a) Color: White

C. Acoustical Panels at Non-Fire-Resistance-Rated Ceilings:

- (1) To establish minimum design and quality standards, acoustical panels are non-directional type equal to **Armstrong Fine Fissured No. 1728 Humiguard Plus** (24" x 24" x 5/8").

(a) Color: White

D. Lay-in Vinyl Faced Gypsum Board Panels at Non-fire-resistance-rated Ceilings: To establish minimum design and quality standards, vinyl-faced gypsum board panels shall be equal to **SheetRock Brand ClimaPlus**, White, No. 3260, by USG, Inc. (24" x 24" x 1/2").2.03 METAL SUSPENSION SYSTEMS, GENERAL

- A. Standard for metal suspension systems: Provide metal suspension systems of type, structural classification and finish indicated which comply with applicable ASTM C-635 requirements.

- B. Finishes and colors: Provide manufacturer's standard factory-applied finish for type of system indicated. For exposed suspension members and accessories with painted finish, provide color indicated, or if not otherwise indicated, as selected by Architect from manufacturer's full range of standard colors.

- C. Attachment devices: Size for 5 times design load indicated in ASTM C-635, Table 1, Direct Hung.

- (1) Hanger wire: Galvanized carbon steel wire, ASTM A-641, soft temper, pre-stretched, Class 1 coating, sized so that stress at 3-times hanger design load (ASTM C-635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gage.

- D. Edge moldings and trim: Steel or Aluminum of types and profiles indicated or, if not indicated, provide manufacturer's standard molding for edges and penetrations of ceiling which fits with type of edge detail and suspension system indicated.

- (1) For lay-in panels with tegular edge details, provide stepped edge "shadow" molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

2.04 EXPOSED METAL DIRECT-HUNG SUSPENSION SYSTEMS

- A. Non-fire-resistance-rated Double Web Steel Suspension System: Manufacturer's standard system roll-formed from cold rolled steel sheet with 15/16" wide exposed faces on structural members; other characteristics as follows:

- (1) Material at lay-in acoustical ceilings: Double-web hot dipped galvanized steel.

- (2) Material at lay-in gypsum board ceilings: Double-web hot-dipped galvanized steel with aluminum cap.
 - (3) Structural classification: Intermediate-duty system.
 - (4) Finish: Painted, white.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:
- (1) Manufacturers of Non-fire-resistance-rated Double Web Steel Suspension Systems:
 - (a) Chicago Metallic Corporation
 - (b) Armstrong World Industries, Inc. (Prelude XL)
 - (c) Donn, USG, Inc.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Measure each ceiling area and establish layout of lay-in units to balance border widths at opposite edges of each ceiling. Where possible, **avoid the use of less-than-half width units at borders**. See Reflected Ceiling Plans on Drawings for layout and coordination/placement of electrical and mechanical elements.

3.02 INSTALLATION

- A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire-resistance rating requirements as indicated, and Cisca standards applicable to work.
- B. Arrange acoustical units as follows: Install tile in non-directional pattern.
- C. Install suspension systems to comply with ASTM C-635, with hangers supported only from building structural steel joists & beams, or from gypsum board fire ceiling & wood roof trusses. Locate hangers not less than 6" from each end and spaced 4'-0" o.c. each carrying channel or direct-hung runner unless otherwise indicated, leveling to tolerance of 1/8" in 12'-0".
- (1) Secure wire hangers by looping and wire-tying directly to structure or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.
 - (2) Install hangers plumb and free from contact with insulation or others objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, counter-splaying or other equally effective means.
- D. Install edge moldings of type indicated at perimeter of ceiling areas and at locations where necessary to conceal edges of units.
- (1) Screw-attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with suspension system to tolerance of 1/8" in 12'-0". Miter corners neatly, accurately, and connect securely.

- E. Install panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe & cut panels to fit accurately at borders & penetrations.
- F. Frame around pipe supports and miscellaneous bracing. Main beams and cross tees shall be spaced to accommodate recessed light fixtures and ceiling grilles as shown on Electrical and Mechanical. Furnish and install extra beams and tees as required for installation of light fixtures. Support grid system at corners of all lay-in light fixtures and other ceiling-mounted items.
 - (1) Ceiling contractor shall furnish and install grid tie-wire supports at corners of all recessed light fixtures. See Electrical for specific support requirements of all interior fixtures.

3.03 CLEANING

- A. Clean exposed surfaces of all lay-in ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

SECTION 09651 - RESILIENT FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of resilient flooring and accessories is shown and scheduled on drawings.
- B. Types of resilient flooring specified in this Section include:
 - (1) Type 1, Type II and Type III Resilient Floor Tile
 - (2) Cove-type Rubber Base
 - (3) Carpet Edge Strips.
 - (4) Reducer Strips.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Provide each type of resilient flooring and accessories adhesives, sealants, and leveling compounds.
- B. Fire test Performance: Provide resilient flooring which complies with fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of resilient flooring and accessory.
- B. Samples for Initial Selection Purpose: Submit manufacturer's standard color charts in form of actual sections of resilient and patterns available, for each type of resilient flooring required.
- C. Maintenance Instructions: Submit 2 copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

1.05 PROJECT CONDITIONS

- A. Maintain minimum temperature of 65 deg. F. (18 deg. C) in spaces to receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less 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 deg. F (13 deg. C) in areas where work is completed.

- B. 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 sufficiently dry to achieve bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture test.

1.06 EXTRA STOCK

- A. Furnish and 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.
- (1) Resilient Tile Flooring: Furnish not less than one box for each 50 boxes or fraction thereof, for each type, color, pattern and size installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

- (1) Manufacturers of Resilient Floor Tile (RFT):

Patcraft (**basis of specification**)

Contact: Todd Vickers, Account Manager
Mobile: 205-910-3710
todd.vickers@patcraft.com

Resilient Floor Tile (RFT) of the specified types by other manufacturers will be considered subject to submission of their product in accordance with the Prior Approval Section of these Specifications. All approved products will be identified by written Addendum. No verbal requests will be accepted and no verbal approvals will be given.

- (2) Manufacturers of Rubber Wall Base, Stair Nosings and Resilient Accessories:

Flexco
Johnson Rubber Co., Inc.
Mannington Commercial
Roppe Rubber Corp.

2.02 RESILIENT FLOORING COLORS

- A. Provide color as selected by Architect from manufacturer's standards.
- (1) Each type of RFT tile will be selected in one color.
- (a) Tile comprising each of the two types will be selected from manufacturer's standard colors in that group.

2.03 TILE FLOORING - GENERAL

- A. Resilient Floor Tile:

(1) Type I RFT - Patcraft "Stratified+"

- (a) Construction: LVT
- (b) Style Name: "Stratified+"
- (c) Style Number: I322V (12"x24")
- (d) Wear Layer Thickness: 20 mil (.020"/.5mm)
- (e) Overall Thickness: .098 (2.5mm)
- (f) Tile shall have a static coefficient of friction greater than or equal to 0.6, per ASTM D2047-82 (for ADA compliance).
- (g) Reference Specification: Class III printed film vinyl tile
- (h) ASTM F 1700: Type A Smooth
- (i) Finish: ExoGuard Quartz Enhanced Urethane

Locations: Lobby 100, Reception 101, Classroom 104, Meeting Rooms 110 and 111

(2) Type II RFT - Patcraft "Typography"

- (a) Construction: LVT
- (b) Style Name: "Charted", "Letterpress", "Typeface"
- (c) Style Number:
"Charted", I313V (24"x24"),
"Letterpress", I311V (24"x24"),
"Typeface", I312V (24"x24")
- (d) Wear Layer Thickness: 20 mil (.020"/.5mm)
- (e) Overall Thickness: .098 (2.5mm)
- (f) Tile shall have a static coefficient of friction greater than or equal to 0.6, per ASTM D2047-82 (for ADA compliance).
- (g) Reference Specification: Class III printed film vinyl tile
- (h) ASTM F 1700: Type A Smooth
- (i) Finish: ExoGuard Quartz Enhanced Urethane

Locations: All other areas scheduled to receive resilient tile not identified in Items (1 and 3).

(3) Type III RFT - Patcraft "Timber Grove II"

- (a) Construction: LVT
- (b) Style Name: "Timber Grove II Resilient Plank"
- (c) Style Number:
I421V (5.96"x48")
- (d) Wear Layer Thickness: 20 mil (.020"/.5mm)
- (e) Overall Thickness: .098 (2.5mm)
- (f) Tile shall have a static coefficient of friction greater than or equal to 0.6, per ASTM D2047-82 (for ADA compliance).
- (g) Reference Specification: Class III printed film vinyl plank
- (h) ASTM F 1700: Type B (embossed)
- (i) Finish: ExoGuard+

Locations: Multi-Purpose 121 and Senior Nutrition 129

2.04 ACCESSORIES

- A. Rubber Wall Base: Provide rubber base complying with FS SS-W-40, Type I, with matching end stops and preformed corner units, and as follows:
 - (1) Height: 4"
 - (2) Thickness: 1/8" gage.
 - (3) Color: As selected from manufacturer's standard colors.
 - (4) Style: Standard top-set cove.
 - (5) Finish: Matte.
- B. Reducer Strip: Equal to Roppe Style #22.
- C. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions. All adhesives shall be asbestos-free.
- E. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- F. Leveling and Patching Compounds: Latex types as recommended by flooring manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Require Installer to inspect subfloor surfaces to determine that they are satisfactory. A satisfactory subfloor 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.
- B. 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.
- C. DO NOT allow resilient flooring work to proceed until subfloor surfaces are satisfactory.

3.02 PREPARATION

- A. Prepare subfloor surfaces as follows:
 - (1) Use leveling and patching compounds as recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors.
 - (2) Remove coatings from subfloor surfaces that would prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives, paint, oils, waxes and sealers.
- B. Broom clean or vacuum surfaces to be covered, and inspect subfloor.
- C. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

3.03 INSTALLATION, GENERAL

- A. Install resilient flooring and/or accessories in patterns indicated on Drawings, using method indicated in strict compliance with manufacturer's printed instructions. Extend resilient flooring into toe spaces, door reveals, and into closets and similar openings.
- B. Scribe, cut, and fit resilient flooring and/or accessories to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.
- C. 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.
- D. Install resilient flooring on covers for telephone and electrical ducts, and similar items occurring 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.
- E. Tightly cement resilient flooring to subbase 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.

3.04 INSTALLATION OF ACCESSORIES

- A. Apply accessories 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 outside corner units and mitered or coped inside corners. Accessories shall be tightly bonded to substrate throughout length of each piece. Provide continuous contact at horizontal and vertical surfaces.
 - (1) On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- B. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

3.05 CLEANING AND PROTECTION

- A. Perform following operations immediately upon completion of resilient flooring:
 - (1) Sweep or vacuum floor thoroughly.
 - (2) Do not wash floor until time period recommended by resilient flooring manufacturer has elapsed to allow resilient flooring to become well-sealed in adhesive.
 - (3) Damp-mop floor being careful to remove black marks and excessive soil.
 - (4) Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient flooring manufacturer.
- B. Protect flooring against damage during construction period to comply with resilient flooring manufacturer's directions.

- C. 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.

END OF SECTION 09651

SECTION 09680 – CARPET

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes carpet flooring as shown on Drawings and Schedules and as indicated by the requirements of this Section.
- B. Related Sections which contain work related to this Section include the following:
 - 1. Division 9, Section “Resilient Flooring” for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

- A. Product Data: For the following, including installation recommendations for each type of substrate:
 - 1. Carpet: For each type indicated. Include manufacturer’s written data on physical characteristics, durability, and fade resistance.
- B. Shop Drawings: Show the following if applicable:
 - 1. Carpet type, color, and dye lot.
 - 2. Seam locations, types, and methods.
 - 3. Type of subfloor and installation.
 - 4. Pattern type, repeat size, location, direction and starting point.
 - 5. Type, color, and location of insets and borders.
 - 6. Type, color, and location of edge, transition, and other accessory strip.
- C. Samples: For each of the following products and for each color and texture required. Label each sample with manufacturer’s name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tiles: Full size sample
 - 2. Carpet Roll Goods: 12” x 12” sample
 - 3. Exposed Edge, Transition, and other Accessory Stripping: 12-inch long samples.
 - 4. Carpet Seam: 6-inch sample.
 - 5. Mitered Carpet Border Seam: 12-inch square sample. Show carpet pattern alignment.
- D. Submit manufacturer’s warranties, installation instructions and maintenance instructions.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

F. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is a member of the Floor Covering Installation Contractors Association (FCICA) and/or certified by the Certified Floorcovering Installers Association (CFI), or who can demonstrate compliance with its certification program requirements. Installer shall be a specialty contractor normally engaged in this type of work with a minimum of three (3) years documented experience in commercial installation of these materials.

1. Carpet flooring contractor shall be responsible for the proper product installation including floor preparation in all areas scheduled to receive carpet. The carpet installation standard will be as listed in The Carpet and Rug Institute's Standard for Installation of Commercial Carpet CRI-104.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling".

1.6 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation".
- B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.
- D. Subfloor preparation shall include all required work to prepare new floors for installation of specified carpets. Comply with manufacturer's written installation requirements.

1.7 WARRANTIES

- A. Special Warranty for Carpet: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Warranty Period: As indicated at each Carpet Type at Part 2, below.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:
1. Carpet Roll Goods:
- a. Full-width rolls equal to two percent (2%) of amount installed for each type indicated.

2. Carpet Tiles:
 - a. (2%) of amount installed for each type indicated.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. The following performance specifications are intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 1 Section of this Section. Equal products by other manufacturers will be considered, subject to submission in accordance with the Prior Approval section of these specifications. Product shall meet the following construction specifications, with no exceptions unless approved by the Owner. Manufacturer's proposed product must be a standard running line product. All warranties and testing information must be standard and cannot be issued on a special/per job basis.
- B. Approved Manufacturers: **Patcraft**

2.2 CARPET (where scheduled on Drawings):

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:
 1. Manufacturers of Carpet Tiles:
 Patcraft (**basis of specification**)
 Contact: Todd Vickers, Contract Specialist
 Mobile: 205-910-3710
todd.vickers@patcraft.com

Carpet of the specified types by other manufacturers will be considered subject to submission of their product in accordance with the Prior Approval Section of these specifications. All approved products will be identified by written Addendum. No verbal requests will be accepted and no verbal approvals will be given.
- B. **Warranties:** Lifetime Commercial Limited Warranty EcoWorx Tile Backing System covering: (Fiber-Abrasive Wear, Fiber-Static Protection, Backing-Tuft Bind, Backing-Edge Ravel, Backing-Integrity/Delamination, Backing-Integrity/Dimensional Stability).

2.3 CARPET – GENERAL

- A. Carpet Tiles:
 - (1) Patcraft "Mid Century Mad"
 - (a) Style Name: "FUTURA"
 - (b) Style Number: 10380
 - (c) Pile Construction: Multi-level Pattern Loop
 - (d) Pile Fiber & Type: Eco Solution Q Nylon
 - (e) Dye Method: 100% Solution Dyed
 - (f) Gauge: 1/10
 - (g) Stitches per Inch: 10.2
 - (h) Tufted Pile height: 5/32" High and 3/32" Low

- (i) Tufted Yarn Weight: 14 oz.
 - (j) Finished Pile Thickness: .080
 - (k) Density: 6.300
 - (l) Tile Size: 24" x 24"
 - (m) Protective Treatment: SSP Shaw Soil Protection
 - (n) Primary Backing: Non-Woven Synthetic
 - (o) Secondary Backing: EcoWorx Tile
- (2) Performance
- (a) Traffic Class: Heavy (TARR)
 - (b) ADA Compliance: Must meet the guidelines as set forth in the Americans with Disabilities Act for minimum static coefficient of friction 0.6 for accessible routes.

2.4 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, non-staining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.
- C. Metal Edge Strips: Extruded Aluminum with mill finish of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints. Edge strips shall be in compliance with the requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- D. Resilient Edge Strips, tapered to meet abutting materials as indicated on Drawings. Edge strips shall be in compliance with the requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet.
 - 3. Subfloors are free of cracks, ridges, depressions, scale and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation", and with carpet manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coating, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

- A. Comply with CRI 104 and carpet manufacturer's written installation instructions for the following:
 - 1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9 "Direct Glue-Down Installation".
- B. Comply with carpet manufacturer's written recommendation and Shop Drawings for seam/joint locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
- C. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings and thresholds. Bind or seal cut edges as recommended by carpet manufacturer.
- D. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.

3.4 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations".

- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer and carpet adhesive manufacturer.

END OF SECTION 09680

SECTION 09900 – PAINTING & STAINING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SCOPE

- A. Provide all materials, labor, services and incidentals necessary for the completion of this section of the Work.
- B. Paint the work of all trades, including Divisions 15 and 26.
- C. Related work specified elsewhere:
 - (a) Shop prime coats of paint: Refer to other Sections.

1.03 SUBMITTALS

- A. Paint Materials List: Submit complete and detailed list of materials within 30 days after construction is started for Architect approval before ordering. Include the following information for each material to be used:
 - (1) Type of surface or use as stated in Painting Schedule herein.
 - (2) Type of material, description, application method.
 - (3) Brand name, exact identification.
 - (4) Manufacturer.
- B. Samples:
 - (1) Submit manufacturer's color charts in duplicate to the Architect within 30 days after the award of the contract with the Paint Materials List.
 - (2) Colors will be selected by the Architect and submitted to the Contractor in scheduled form. More than one color will be selected.
 - (3) Provide two samples of stained finish on hardwood, for each type specified, to Architect for approval prior to starting work. Samples shall be on specified wood and 4" x 8" in size.

1.04 ENVIRONMENTAL CONDITIONS

- A. Perform all exterior work during favorable weather conditions only and when temperature is 50 degrees F or above.
- B. Adequately ventilate all spaces to remove all moisture of construction from building to prevent mildew and improper drying of paint.
- C. Maintain constant temperature of 65 degrees F or above after painting has started. Avoid wide variations of temperature.

- D. Before painting has started in any area, broom clean and remove all direct dust.
- E. After painting is started, broom cleaning not allowed. Use commercial vacuum cleaning equipment only for cleaning.

1.05 PRODUCT DELIVER, STORAGE AND HANDLING

- A. Deliver materials to the Project Site in strong, undamaged, waterproof containers with manufacturer=s labels intact. Materials in previously opened or unsealed containers are not acceptable.
- B. Immediately upon delivery to the Project Site, store and lock all paint materials in an area within the building. Keep locked at all times except when materials are being prepared or removed for use on the Project.

PART 2 - PRODUCTS

2.01 GENERAL

- A. No materials will be allowed on the Project Site at any time during construction except those of the manufacturers specified or approved by the Architect.
- B. Mix all materials in and apply directly from containers in which they are purchase except when use of other containers is approved by the Architect.

2.03 QUALITY

- A. Certain manufacturer=s products are specified herein to simplify description of types and qualities of finishes required. Only the highest quality materials are acceptable.
- B. Primers: As specified by manufacturer of finish paint used and as approved by the Architect.
- C. Turpentine: Conform to FS TT-T-801.
- D. Mineral Spirits: Conform to FS TT-T-291A, Grade 1.
- E. Linseed Oil: Conform to FS TT-L-190 (boiled).
- F. Shellac: Conform to FS TT-S-300 4 lb. cut.
- G. Thinners: As recommended by the manufacturer of the specified paint material.

2.04 MANUFACTURERS

Pittsburgh; PPG Industries, Inc.	Sherwin Williams
Glidden	Devoe
Benjamin-Moore	Olympic

PART 3 - EXECUTION

3.01 GENERAL

- A. Examine all surfaces to see that they are in proper condition to be finished before proceeding with the work. Starting work will constitute the painter's acceptance of

preceding work and conditions under which finish will be applied and his assumption of responsibility for results to be obtained.

- B. Number of coats and quality of finish shall be in accordance with these specifications, which require the use of materials which will produce first quality finish if properly applied.
- C. Except as otherwise approved by the Architect, apply all paint by roller or brush application. Roller application not permitted for stain and transparent finishes.
- D. Protect the work of this section and work of others during progress against damage and promptly repair such damage such any occur. Cover factory finished members with heavy paper and masking tape. Do not allow masking tape to touch finished surfaces.
- E. Paint all exposed surfaces, whether or not colors are designated in any Aschedule@, except where the natural finish of the material is obviously intended or a surface is specifically noted not to be painted.

3.02 PREPARATION OF SURFACES

A. General:

- (1) Clean all surfaces and protect from dampness.
- (2) Remove all foreign material which will adversely affect adhesion or appearance of applied coatings.
- (3) Remove all efflorescence from masonry to be painted.

B. Wood:

- (1) Touch up knots, resinous spots, etc., on both new and existing surfaces with WP 578 sealer 18 hours before applying prime coat of paint.
- (2) Sand to smooth surface and dust before priming.
- (3) Putty nail holes, cracks and blemishes after priming coat has dried. Fill nail holes flush. Concave filled holes not acceptable.
- (4) Match putty color to finish coat.

C. Metal:

- (1) Clean greasy or oily surfaces with turpentine or mineral spirits and wipe dry with clean cloths before applying any materials.
- (2) Remove rust and scale before painting and treat with rusticide.
- (3) Touch-up weld, cuts and scratches or scuffed marks with metal protective primer. (Primer shall match initial coat.) Fill all dents or scratches with spot putting DLF-40 by Ditzler Color Division and sand level and smooth before painting. Grind if necessary to remove shoulders.
- (4) Clean all galvanized metal surfaces with proprietary cleaner designed for this purpose, used in accordance with their manufacturer's directions before applying the first coat of paint.

- D. Cementitious Materials: Prepare cementitious surfaces of concrete and concrete block to be painted by removing efflorescence, chalk, dirt, dust, grease and oils. Do not paint over surface where alkalinity or moisture content exceeds that permitted in manufacturer's printed directions.

E. Drywall:

- (1) Fill all irregularities with patching material and sand to smooth level surface.
- (2) When sanding, avoid raising nap of paper.

3.03 APPLICATION

- A. Allow exterior paints to dry 72 hours between coats and interior paints to dry 24 hours between coats. Allow additional time until finish is dry if necessary.
- B. Finish tops, edges, bottoms of all doors same as faces. Remove door if necessary.
- C. Only the best workmanship is acceptable. All material shall be spread and smoothly flowed on without run, streaks, sags, brush marks, unfinished patches or other blemishes.
- D. Remove finish hardware prior to finish doors.
- E. Apply coats of material in strict accordance with manufacturer=s current published specifications except where requirements of these specifications are in excess of manufacturer=s requirements.
- F. Sand lightly between coats at no additional cost when undercoats, stains or other conditions show through the final coat until paint film is of uniform finish, color and appearance.
- G. Paint interior surfaces of ducts visible through registers, grilles with flat, non-specular black paint.
- H. Paint back side of all access panels, hinged covers to match exposed surfaces.

3.04 CLEAN-UP

- A. Clean all paint spots from all work and touch up or otherwise repair any defective or damaged work.
- B. Remove all surplus materials and equipment after work is completed, except leave excess paint with Owner for future touch-up work.
- C. Leave entire job clean and acceptable to Architect.
- D. Perform all "touch-up" work necessary after other mechanics have finished their work.

3.05 SCHEDULE OF FINISHES

- A. General: The following specification for finishing is not intended to mention every particular item which will receive painter=s finish, but it is intended to establish type and quality of finish which will be required on various materials.
- B. EXTERIOR PAINT SCHEDULE:
 - (1) General: Provide the following paint systems for the various substrates indicated

- (2) Ferrous materials:
1st Coat: B50NZ6 Kemkronik Universal Metal Primer, or equal.
2nd Coat: semi-gloss alky enamel (TT-E-529, Class A).
3rd Coat: semi-gloss alkyd enamel (TT-E-529, Class A).
First coat not required on items delivered shop primed.
Extent: Steel doors & frames (not specified as pre-finished), steel angle lintels, steel pipe bollards, roof accessories (prime-coated items not specified as pre-finished), gas piping (if any) and any other new exposed ferrous metal items, except as indicated at item 3 below.
- (3) Exterior Steel Tube Handrails, Guardrails, Gates and Fencing at locations where they occur:
- (a) Powder Coating: Shop-applied exterior-grade polyester resin, equal to Tiger Drylac Series 38 two-coat system.
- Prepare, clean and pretreat steel members by sandblasting, phosphatizing or other methods as recommended by paint manufacturer.
 - Primer: Equal to Tiger Drylac 69/70000; 2.4-2.6 mil dry film thickness.
 - Topcoat: Equal to Tiger Drylac Series 38 (Smooth Matte) 2.4-2.6 mil dry film thickness.
 - Color: As selected by Architect.
- (4) Plumbing Roof Vents and PVC Downspout Boots as follows:
- (a) Primer (where required): Zinc dust zinc oxide primer (TT-P-641) on zinc-coated metal.
First coat: Semi-gloss alkyd enamel (TT-E-529).
Second coat: Semi-gloss alkyd enamel (TT-E-529).
- (5) Zinc Coated Metal:
1st and 2nd Coat: B50WZ30 Galvite HS Primer, or equal.
3rd Coat: Semi-gloss enamel (TT-E-509)
Not less than 2.5 mils dry film thickness.
- (6) Moulded Dentil Blocks:
- (a) Semi-gloss Finish
- (b) 1st Coat: S-W PrepRite ProBlock Latex Primer, B51 Series (4 mils wet, 1.4 mils dry)
- (c) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series
- (d) 3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4 mils wet, 1.5 mils dry per coat)
- (e) Dentil blocks shall be "primed" if required and painted prior to installation at soffit locations.

C. INTERIOR PAINT SCHEDULE:

- (1) General: Provide the following paint systems for the various substrates indicated.
- (2) Zinc Coated Metal:
1st and 2nd Coat: B50WZ30 Galvite HS Primer, or equal.
3rd Coat: semi-gloss enamel (TT-E-509).

Not less than 2.5 mils dry film thickness.

Extent: Electrical panelboard conduit covers, Exposed conduits in finish areas.

(3) Ferrous Metals

Extent:

- (a) Steel Doors & Frames;
- (b) Exposed Structure - where scheduled to be painted (columns, joists, beams, metal roof deck and miscellaneous exposed steel framing):

1st Coat: Enamel undercoater (TT-E-543). Touch-up shop primer as required.

2nd Coat: Semi-gloss enamel (TT-E-509).

3rd Coat: Semi-gloss enamel (TT-E-509).

No less than 2.5 mils dry film thickness.

First coat not required on items delivered shop primed.

(4) Gypsum Drywall Systems:

- (a) Odorless Eggshell Latex Enamel Finish: Three coats with total dry film thickness not less than 2.5 mils.

- (b) Primer: White, interior, latex-based primer.
Devoe - 50801 Wonder-Tones latex Primer and Sealer.
Glidden - 5019 PVA Primer.
Moore - Moore's Latex Quick-Dry Prime Seal #201
PPG - 6-2 Quick-Dry Latex Primer Sealer.
S-W - Prep Rite 200 Latex Wall Primer.

- (c) First and Second Coats: Interior latex eggshell enamel.
Devoe - 34XX Wonder-Tones Interior Latex Eggshell enamel.
Moore - Regal AquaVelvet 319.
S-W - Pro XP Interior Latex Eggshell (B20-3200 Series).

(6) Woodwork - Painted:

- (a) Semi-gloss Enamel Finish: 3 coats.
Undercoat: Interior Enamel Undercoat (FS TT-E-543).
1st and 2nd Coats: Interior Semi-gloss Odorless Alkyd Enamel (FS TT-E-509).
- (b) Extent of Painted Woodwork: Plywood Backboards at Electrical Equipment.

END OF SECTION 09900

SECTION 10155 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

- A. Extent of toilet compartments is indicated on drawings.
- B. Types of toilet compartments include:
 - (1) S.P.C. (Solid Phenolic Core).
- C. Styles of toilet compartments include:
 - (1) Floor-anchored, overhead braced.
- D. Toilet compartment accessories, are specified elsewhere in Division 10.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of toilet partition assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.
- C. Samples: Submit full range of color samples for each type of unit required.

1.04 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of work. However, allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay work.
- B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to,

the following:
Bobrick Washroom Equipment, Inc.
Columbia Partitions, Partition Systems, Inc.
General Partitions Mfg. Corp.
Metpar

2.02 MATERIALS

- A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.
- B. Finish: Matte finish, high pressure melamine fusion welded to surface of core.
- C. Core Material (minimum thickness):
 - (1) Toilet Compartment Dividers: 1/2" thick solid phenolic.
 - (2) Toilet Compartment Doors: 3/4" thick solid phenolic.
 - (3) Pilasters: 1" thick solid phenolic.
- D. Pilaster Shoes: ASTM A167, Type 302/304 stainless steel minimum 3" high, 20 gage.
- E. Wall and Pilaster Brackets: Full-length, heavy-duty Type 304 stainless steel channel type brackets at toilet compartments and screens.
- F. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of cast stainless steel.
- G. Overhead-Bracing: Continuous extruded aluminum, anti-grip profile, with clear anodized finish.
- H. Anchorage and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.

2.03 FABRICATION

- A. General: Furnish standard doors, panels, screens, and pilasters fabricated for partition system, unless otherwise indicated. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated.
- B. Door Dimensions: Unless otherwise indicated, furnish 24" wide in swinging doors for ordinary toilet stalls and 34" wide out-swinging doors at stalls equipped for use by handicapped.
- C. Solid Phenolic Core (S.P.C.):
 - (1) General: High pressure one-piece melamine face sheets fusion welded to core material with no splices or joints, and with edges straight and sealed.
 - (2) Overhead-Braced Partitions: Furnish galvanized steel supports and leveling bolts at pilasters, as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous extruded aluminum anti-grip

overhead-bracing at top of each pilaster. Furnish shoe at each pilaster to conceal supports and level mechanism.

- (3) Hardware: Furnish hardware for each compartment in partition system, as follows:
- (a) Continuous Hinge:
 - (1) Continuous Piano Type, door hinge made of extruded aluminum, 6063-T5. Satin anodized finish. Knuckles shall have nylon separators; pivot pin shall be 1/4" type 304 stainless steel.
 - (2) Pre-drill hinge for stainless steel tamper proof bolts, spaced at maximum of 8" on center.
 - (3) Fasteners shall be concealed beneath snap on cover. Cover shall be attached at top and bottom with theft proof fasteners.
 - (b) Latch and Keeper: Manufacturer's standard surface-mounted slide latch unit, designed for emergency access, with combination rubber-faced door strike and keeper.
 - (c) Coat Hook: Manufacturer's standard unit, combination hook and rubber-tipped bumper, sized to prevent door hitting mounted accessories.
 - (d) Door Pull: Manufacturer's standard unit for out-swing doors.
 - (e) Door Bumper at Out-swing Doors @ Handicap Stalls adjacent to walls: Provide wall bumper equal to Rockwood Manufacturing Co. No. 408, concealed mounting, US26D finish. Confirm final mounting location with Architect.
 - (f) At handicap stalls, furnish latch, pull and keeper hardware to comply with Title III of the Americans with Disabilities Act (ADA).
- (4) Colors: Plastic laminate or melamine facing to be selected from Architect's choice of any Wilsonart, Formica or Nevamar product.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Comply with manufacturer's recommended procedures and installation sequence. Install partitions rigid, straight, plumb, and level. Provide clearance of not more than 1/2" between pilasters and panels, and not more than 1" between panels and walls. Secure panels to walls and pilasters with full length channel type brackets. Secure panels in position with manufacturer's recommended anchoring devices.
- B. Overhead-Braced Partitions: Secure pilasters to floor and level, plumb, and tighten installation with devices furnished. Secure overhead-brace to each pilaster with not less than two fasteners. Hang doors and adjust so that tops of doors are parallel with overhead-brace when doors are in closed position.

3.02 ADJUST AND CLEAN

- A. Hardware Adjustment: Adjust and lubricate hardware for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return to fully closed position.
- B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period.

END OF SECTION 10155

SECTION 10425 - SIGNAGE AND PLAQUES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections apply to the work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of signage is indicated on Drawings and as follows:
 - (1) Interior panel signs.
 - (2) Exterior dimensional letters.
 - (3) Cast Metal Plaque
- B. Exterior post-mounted handicap parking signs and other site required exterior site signage is specified on the Civil Drawings.
- C. Illuminated exit signs are specified in a Division 16 section.
- D. Painted fire wall identification Signs are specified in Section 09900 "Painting."
- E. Temporary signage is specified in a Division 1 section.

1.03 QUALITY ASSURANCE

- A. Uniformity of Manufacturer: For each sign form and graphic image process indicated, furnish products of a single manufacturer.

1.04 SUBMITTALS

- A. Shop drawings: Submit shop drawings for fabrication and erection of signs and plaques. Include plans, elevations and large-scale details of sign wording and lettering layout. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.
 - 1. Submit full size rubbing of cast metal plaque
- B. Product data: Submit manufacturer's technical data and installation instructions for each type of sign required.
- C. Samples: Submit samples of each sign form and material showing finishes, colors, surface textures and qualities of manufacturer and design of each sign component including graphics.
 - (1) Architect will select colors for panel signs from manufacturer's standard colors.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following.
- (1) Manufacturers of Panel Signs and Die-Cut Vinyl Signs:
ASI Sign Systems, Inc.
Leeds Aluminum Letters, Inc.
 - (2) Manufacturers of Dimensional Letters:
A.R.K. Ramos Manufacturing Co., Inc.
ASI Signs Systems, Inc.
Leeds Aluminum Letters, Inc.

2.02 MATERIALS

- A. Signage: For purposes of determining minimum performance and quality standards, interior and exterior signage, as shown and scheduled on Drawings and specified herein, shall be equal to products of Leeds Architectural Letters of Alabama, Inc., 9039 Parkway Drive, Leeds, AL 35094 (205-699-5271/FAX 205-699-3342).
- (1) Other sign manufacturers wishing to be considered must submit their request to the Architect in accordance with the Prior Approval section of the specifications. At the Architect's determination, submissions may require samples and other detailed information needed to compare submitted products to those specified on Drawings. Acceptance of approved submissions will be by written Addendum only. No Exceptions.
- B. Aluminum Castings: Provide aluminum castings of F-214 alloy and temper recommended by the aluminum producer and finisher for the casting process used and for the use and finish indicated.
- C. Bronze Castings: Provide bronze castings, copper alloy UNS C83600, complying with the requirements of ASTM B584.
- E. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.
- F. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.
- G. Anchors and Inserts: Use non-ferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.03 FABRICATION

- A. Panel Signs: Fabricate panel signs with edges mechanically and smoothly finished to conform to the following requirements:

- (1) Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions with a tolerance of plus or minus 1/16" measured diagonally.

2.04 GRAPHIC IMAGE PROCESS

- A. Graphic Content and Style: Provide sign copy to comply with the requirements indicated for sizes, styles, spacing, content, positions, materials, finishes and colors of letters, numbers, symbols and other graphic devices. Graphic technique for all signage not indicated to have 1/32" raised lettering, braille, or graphics shall be screen process.

Raised Copy: 1/32" high machine-cut text, graphics, and border. Produce precisely formed characters with square cut edges free from burrs and cut marks. No adhesive mounted (surface applied) text, graphics or borders will be accepted.

- (1) Panel Material: 1/8" thick MP Plastic consisting of two-color melamine surface laminate with non-glare surface over phenolic core.

2.05 CAST METAL PLAQUES

- A. Cast Metal Plaques: Fabricate cast metal plaques to comply with requirements specified for metal, border style, background texture and finish and to comply with requirements shown for thickness, size, shape and copy. Produce castings free from pits, scale, sand, holes or other defects. Hand tool and buff borders and raised copy to produce the manufacturer's standard satin polished finish. Refer to Item (4), "Finish" for other finish requirements.

- (1) Metal: Aluminum
- (2) Border: Raised flat band, as indicated on Drawings.
- (3) Background Texture: Manufacturer's standard dark leatherette finish.
- (4) Finish: Two coats of clear acrylic lacquer.
- (5) Size: Approximately 24" high x 30" wide.
- (6) Text: To be furnished by Architect - 300 letters maximum per Plaque.
- (7) Letter Style: Times Roman.

2.06 DIMENSIONAL LETTERS

- A. Cast Letters: Form individual letters by casting. Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs, for installation on face brick wall. Comply with requirements indicated for finish, style and size.

- (1) Metal: Aluminum
- (2) Letter Height and Wording: 10" high letters in two (2) rows, reading "GADSDEN SENIOR WELLNESS CENTER".
- (3) Letter Style: Equal to Metal Arts Style No. 106 Helvetica Medium.
- (4) Finish & Color: Equal to Metal Arts No. 30 Colored Satin anodized; Final color to selected by Architect from manufacturer's standard colors.
- (5) Flush Mounting: Equal to Metal Arts Method "FMM-1" or "FMM-2", for mounting to face brick wall. Final location of letters to be determined in the field.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General: Locate sign units and accessories as shown or scheduled, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 - (1) Install sign units level, plumb and at the height indicated, with surfaces free from distortion or other defects in appearance.
- B. Panel Signs: Attach panel signs to surfaces using the methods indicated on Drawings or as recommended by manufacturer.
- C. Dimensional Letters: Mount letters using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.
 - (1) Flush Mounting: Mount letters with backs in contact with the wall surface.

3.02 CLEANING AND PROTECTION

- A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

3.03 SCHEDULE OF INTERIOR AND EXTERIOR SIGNAGE

- A. As indicated on Drawings.

END OF SECTION 10425

SECTION 10520 - FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of fire extinguishers and cabinets is indicated on drawings.
- B. Definition: "Fire Extinguishers" as used in this section refers to units which can be hand-carried as opposed to those which are equipped with wheels or to fixed fire extinguishing systems.
- B. Types of products required include:
- (1) Fire extinguishers.
 - (2) Fire extinguisher cabinets.

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain products in this section from one manufacturer.
- B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating and classification of extinguisher indicated.

1.04 SUBMITTALS

- A. Product Data: Submit product data for each type of product included in this section.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
- Amerex Corporation.
 - J.L. Industries
 - Larsen's Mfg. Co.
 - Watrous, Inc.

2.02 FIRE EXTINGUISHERS

- A. 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.

- (1) Abbreviations indicated below to identify extinguisher type related to UL classification and rating system and not, necessarily to type and amount of extinguishing material contained in extinguisher.

B. Multi-Purpose Dry Chemical Type: UL-rated 4-A:60-B:C, 10 lb. nominal capacity, in red enameled steel container, for Class A, Class B and Class C fires.

2.03 EXTINGUISHER CABINETS

A. General: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated.

B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door, and hardware to suit cabinet type, trim style and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.

C. Cabinet Type: Suitable for mounting conditions indicated, of the following types:

- (1) Semi-recessed: Cabinet box (tub) partially recessed in walls of shallow depth (total drywall partition thickness = 4-7/8").

D. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.

- (1) Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

(a) Rolled-Edge Trim with 4 inch backbend depth.

(b) Trim Metal: Aluminum.

E. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

- (1) Aluminum: Manufacturer's standard flush, hollow aluminum door construction.

- (2) Door Glazing: Tempered float glass complying with ASTM C 1048, Quality q3, Type I, Class as follows:

(a) 1/8" thick clear glass, Class 1 (transparent).

F. Door Style: Manufacturer's standard design with full-glass panel.

G. Door Hardware: Provide Manufacturer's standard door-operating hardware of proper type from 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. Provide concealed or continuous-type hinge permitting door to open 180 deg.

2.04 ALUMINUM FIRE EXTINGUISHER CABINET FINISHES

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

- B. Protect mechanical finishes on exposed surfaces from damage by application of strippable, temporary protective covering prior to shipment.
- C. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Class II Clear Anodized Finish: AA-M12C22A31 (Mechanical Finish: as fabricated, non-specular; Chemical Finish: etched, medium matte; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
- B. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

END OF SECTION 10520

SECTION 10650 - OPERABLE PARTITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:

1. Manually operated, paired panel operable partitions.

- B. Related Sections include the following:

1. Division 3 Sections for concrete tolerances required.
2. Division 5 Sections for primary structural support, including pre-punching of support members by structural steel supplier per operable partition supplier's template.
3. Division 6 Sections for wood framing and supports, and all blocking at head and jambs as required.
4. Division 9 Sections for wall and ceiling framing at head and jambs.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.
- B. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.
- C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 "Standard practice for Architectural Application and Installation of Operable Partitions."

1.04 SUBMITTALS

- A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.
- B. Shop Drawings: Show location and extent of operable partitions. Include plans, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.
- C. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.
- D. Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.
- B. Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as

required to prevent damage.

1.06 **WARRANTY**

- A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.
- B. **Warranty Period: Two (2) Years from date of shipment.**

PART 2 - PRODUCTS

2.01 **MANUFACTURERS, PRODUCTS, AND OPERATIONS**

- A. Manufacturers: As a basis of establishing performance and quality, the following manufacturer and product has been afforded prior approval. Manufacturers of comparable products will be given consideration subject to submission of their product in accordance with the Prior Approval section of these specifications.
 - 1. Kwik-Wall
- B. Products: Subject to compliance with the requirements, provide the following product:
 - 1. Meeting Rooms 110/111 Kwik-Wall Model 2030 manually operated paired panel operable partition.

2.02 **OPERATION**

- A. Meeting Rooms 110/111: Kwik-Wall Model 2030: Series of paired flat panels hinged together in pairs, manually operated, top supported with operable floor seals.
- B. Final Closure:
 - 1. Meeting Rooms 110/111: Horizontally expanding panel edge with removable crank.

2.03 **PANEL CONSTRUCTION**

- A. Nominal 3-inch (76mm) thick panels in manufacturer's standard 48-inch (1220mm) widths. All panel horizontal and vertical framing members fabricated from minimum 18-gauge formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.
- B. Panel skin shall be:
 - 1. Meeting Rooms 110/111: 0.50-inch (13mm) tackable fire core "C" gypsum board, class "A" rated single material or composite layers continuously bonded to panel frame. Acoustical ratings of panels with this construction:
 - a. 41 STC
- C. Hinges for Panels, Closure Panels, Pass Doors, and Pocket Doors shall be:
 - 1. Meeting Rooms 110/111: Full leaf butt hinges, attached directly to the panel frame. Welded hinge anchor plates within panel shall further support hinge mounting to frame. Hinges mounted into panel edge or vertical astragal are not acceptable.
- D. Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel joints.
- E. Panel Weights:
 - 1. Meeting Rooms 110/111: 41 STC - 7 lbs./square foot.

2.04 PANEL FINISH

- A. Panel finish shall be factory applied, Class "A" rated material. Finish shall be:
 - 1. Meeting Rooms 110/111: Reinforced vinyl with woven backing weighing not less than 15 ounces per lineal yard.
- B. Panel Trim: Exposed panel trim of one consistent color:
 - 1. Meeting Rooms 110/111: To be advised.

2.05 SOUND SEALS

- A. Vertical interlocking sound seals between panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic astragals or astragals in only one panel edge are not acceptable.
- B. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.
- C. Horizontal bottom floor seals shall be:
 - 1. Meeting Rooms 110/111: Bottom Seal. Manually activated bottom seals with self-contained handle providing nominal 2-inch (51mm) operating clearance with an operating range of +0.50 inch (13mm) to -1.50 inch (38mm). Seal shall be operable from panel edge or face.

2.06 SUSPENSION SYSTEM

- A. Meeting Rooms 110/111: Suspension System
 - 1. Suspension Tracks: Minimum 11-gauge, 0.12" (3.04mm) roll-formed steel track, suitable for either direct mounting to a wood header or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 0.38" (10mm) diameter threaded rods. Aluminum track is not acceptable.
 - a. Exposed track soffit: Steel, integral to track, and pre-painted off-white.
 - 2. Carriers: One all-steel trolley with steel-tired ball bearing wheels per panel (except hinged panels). Non-steel tires are not acceptable.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.
- B. Install operable partitions and accessories after other finishing operations, including painting have been completed.
- C. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.
- D. Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

3.02 CLEANING AND PROTECTION

- A. Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer that ensure operable partitions are without damage or deterioration at time of Substantial Completion.

3.03 ADJUSTING

- A. Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.04 EXAMINATION

- A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.05 DEMONSTRATION

- A. Demonstrate proper operation and maintenance procedures to Owner's representative.
- B. Provide Operation and Maintenance Manual to Owner's representative.

END SECTION 10650

SECTION 10801 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of each toilet and bath accessory is indicated and scheduled on Drawings.
- B. Types of toilet and bath accessories required include the following:
 - (1) Toilet tissue dispensers
 - (2) Grab bars
 - (3) Mirrors
 - (4) Feminine Napkin Disposal Units
 - (5) Mop & Broom Holders
 - (6) Countertop-Mounted Waste Chutes
 - (7) Waste Baskets
 - (8) Mop and Broom Holders
 - (9) Door Bumpers at out-swing handicap toilet stall doors.

1.03 QUALITY ASSURANCE

- A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.
- B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.
- C. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering toilet accessories which may be incorporated in the work include, but are not limited to, the following:

Bobrick Washroom Equipment, Inc.
Bradley Corporation

- B. In order to establish a standard of design and quality, catalog numbers on Drawings refer to Bobrick products. Equal items by above manufacturers will be accepted, subject to submission in accordance with the Prior Approval section of these specifications.

2.02 MATERIALS, GENERAL

- A. Stainless Steel: AISI Type 302/304, with polished or satin finish, 22 gage (.34") minimum as indicated.
- B. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20-gage (.40") minimum, unless otherwise indicated, Surface preparation and metal pretreatment as required for applied finish.
- C. Galvanized Steel Sheet: ASTM A 527, G60.
- D. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.
- E. Mirror Glass: FS DD-G-451, Type I, Class 1, Quality q2, 1/4" thick, with silver coating, copper protective coating, and non-metallic paint coating complying with FSDD-M-411.
- (1) Mirrors shall be guaranteed against silver spoilage for a minimum of ten (10) years.
- F. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- G. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.03 SPECIFIC TOILET ACCESSORIES

- A. Provide all accessories as indicated at "Toilet Accessories Schedule", on Drawings.

2.04 FABRICATION

- A. General: Only an unobtrusive stamped logo of manufacturer, as approved by Architect is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by means of either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
- C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full-length stainless steel piano hinge. Provide anchorage which is fully concealed when unit is closed.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install toilet accessory units in accordance with manufacturers' instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.
 - (1) Provide concealed wood blocking in drywall partitions as required for anchoring of accessories.

3.02 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces after removing temporary labels and protective coatings.

END OF SECTION 10801

SECTION 11452 - APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Drawings and specifications are to be considered as complementary each to the other. What is called for by one shall be as binding as if called for by both. Where conflicts occur, secure clarification from Architect in advance of bidding; otherwise provide the more expensive quality or quantity. Follow figures in preference to scale dimensions; Verify all equipment quantities and utility requirements.

1.2 SUMMARY

- A. This Section includes food service equipment indicated on Drawings and Schedules. Provide all equipment, labor, material and services necessary and reasonably incidental to furnishing and installing all equipment herein specified except where such items are noted, scheduled, or specified to be furnished and/or installed by others. Deliver all equipment of this section to its location on site with all transportation charges prepaid.
- B. Related Sections include the following:
 - 1. Division 5 Section "Miscellaneous Metals" for equipment supports.
 - 2. Refer to Division 15 Sections for supply and exhaust fans; exhaust ductwork; service roughing-ins; drain traps; atmospheric vents; valves, pipes, and fittings; fire-extinguishing systems; and other materials required to complete food service equipment installation.
 - 3. Refer to Division 26 Sections for connections to fire alarm systems, wiring, disconnects, and other electrical materials required to complete food service equipment installation.

1.3 DEFINITIONS

- A. Terminology Standard: Refer to NSF 2, "Food Equipment" or other applicable NSF standards for definitions of food service equipment and installation terms not otherwise defined in this Section or in other referenced standards.

1.4 SUBMITTALS

- A. Product Data: For each type of food service equipment indicated. Include manufacturer's model number and accessories and requirements for access and maintenance clearances, water and drainage, power or fuel, and service-connections including roughing-in dimensions. Within 30 days after notice to proceed, and before equipment is purchased, submit at least eight (8) sets of Product Data Booklets for approval. Booklets shall include the manufacturer's literature for each equipment item along with a type written specification cover sheet identifying equipment characteristics, utility requirements, and specified options. Material shall be assembled in chronological order by item number as specified herein and bound in three (3) ring binder with hard board cover. Each booklet shall be complete and include all items. Architect shall retain 4 Booklets.

- B. Shop Drawings: For food service equipment not manufactured as standard production and catalog items by manufacturers. Include plans, elevations, sections, roughing-in dimensions, fabrication details, service requirements, and attachments to other work. The F.S.E.C. will submit for approval as soon as possible and within 30 days after notice to proceed, detail drawings of each fabricated item in a minimum of 3/4" scale, showing all dimensions, details of construction, material, finish, gauge, installation and relation to adjoining and related work. Show all reinforcement, anchorage and other work required for complete installation. Show the exact quantity required and the Item Number below each drawing as well as in the title block located in the lower right-hand corner of the sheet so that, when ultimate prints are folded to 8-1/2" X 11", the Item Number(s) show. Omissions and discrepancies on approved drawings shall not relieve the F.S.E.C. of providing Items as specified and shown on contract drawings. Submit shop drawings in electronic format. Shop drawings as submitted shall be submitted in same format size as roughing-in drawings and shall be capable of being printed for use on site. Include plans, elevations, sections, roughing-in dimensions, fabrication details, service requirements, and attachments to other work.
1. Wiring Diagrams: Details of wiring for power, signal, and control systems and differentiating between manufacturer-installed and field-installed wiring.
 2. Piping Diagrams: Details of piping systems and differentiating between manufacturer-installed and field-installed piping.
- C. Coordination Drawings: For locations of food service equipment and service utilities. Key equipment with item numbers and descriptions indicated in Contract Documents. Include plans and elevations of equipment, access- and maintenance-clearance requirements, details of concrete or masonry bases and floor depressions, and service-utility characteristics. The F.S.E.C. will submit for approval as soon as possible and within 30 days after notice to proceed, roughing-in drawings in electronic format so that when printed they are a minimum scale of 1/4" = 1'-0". These drawings will indicate the size and where each hot and cold water, waste, indirect waste, and electric connection is to stub out of the walls or floor. All items referenced in the Itemized Specifications shall be provided for on this drawing. Each stub-out point will be dimensioned so that the total of individual dimensions on a line will equal the known distance between walls or columns or two other reference points. The roughing-in drawings will also indicate the dimensions of floor depressions, raised bases and wall openings for equipment. The services will be roughed-in to suit the drawing and the F.S.E.C. shall be responsible for conforming to these conditions with his equipment and connections thereto. In addition to the roughing-in drawings, the F.S.E.C. shall submit to the Architect for approval a Food Service Equipment Schedule which will indicate in reasonable detail the pertinent mechanical information required to make the hook-ups, i.e., the maximum utility demands, the quantity, exact size and connection characteristic of all valves, faucets, etc. This shall include future and not-in-contract items. Submit roughing-in drawings in electronic format. Roughing-in drawings as submitted shall be submitted in same format size as Shop drawings and shall be capable of being printed for use on site. Include plans, elevations, sections, roughing-in dimensions, fabrication details, service requirements, and attachments to other work.
- D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for exposed products with color finishes.
- E. Product Certificates: Signed by manufacturers of refrigeration systems or their authorized agents certifying that systems furnished comply with requirements and will maintain operating temperatures indicated in the areas or equipment that they will serve.
- F. Maintenance Data: Operation, maintenance, and parts data for food service equipment to include in the maintenance manuals specified in Division 1. Include a product schedule as follows:

1. Product Schedule: For each food service equipment item, include item number and description indicated in Contract Documents, manufacturer's name and model number, and authorized service agencies' addresses and telephone numbers.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing food service equipment, who has completed installations similar in design and extent to that indicated for this Project, and who has a record of successful in-service performance.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing food service equipment similar to that indicated for this Project and with a record of successful in-service performance. It is required that all "Fabricated Special" items of equipment such as food service units, tables, sinks, countertops, etc., described in the following specifications other than by name and catalog numbers, be manufactured by a Food Service Equipment Fabricator who has the plant, personnel and engineering facility to properly design, detail and manufacture high quality Food Service Equipment. The manufacturer shall be subject to the approval of the Architect and owner. All work in the above category shall be manufactured by one manufacturer and shall be of standard unit assembly and of uniform design and finish. The manufacturer of this equipment must be able to show that he has, for the past seven years, been engaged in the manufacture of and distribution of equipment as required under the contract as his principal product. Pre-bid approval is required.
- C. Source Limitations: Obtain each type of food service equipment through one source from a single manufacturer.
- D. Product Options: Drawings indicate food service equipment based on the specific products indicated. All approved manufacturers listed in the written specifications and schedules under this section are given contingent prior approval subject to final submittal review with respect to equality. Based upon limited availability of time, the review for Prior Approval during the bidding process is cursory and not exact. Prior Approval at this stage gives the vendor the right to submit a proposal based upon his certification/representation that the product is equal in every way. The burden of proof of equality lies with the requesting vendor, not the Architect or his consultants. Any product misrepresented by any vendor as equal will be subject to complete rejection at the time of formal submittal review. General Contractors, subcontractors, and vendors shall be fully responsible for the coordination of and adherence to this criterion contingent upon meeting the exact requirements of the specifications. Any modifications and/or substitutions, other than the first named, that require changes in plumbing, mechanical, or electrical shall be coordinated and paid for by the F.S.E.C. The Architect reserves the right to accept or reject each proposed substitution and such decision shall be final and binding upon all parties. All proposed equipment substitutions must be submitted to the Architect, in accordance with the Prior Approval section of these specifications.
- E. Regulatory Requirements: Comply with the following National Fire Protection Association (NFPA) codes where applicable to equipment being provided:
 1. NFPA 17A, "Wet Chemical Extinguishing Systems."
 2. NFPA 70, "National Electrical Code."
 3. NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations."
- F. Listing and Labeling: Provide electrically operated equipment or 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. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

- G. ASHRAE Compliance: Provide mechanical refrigeration systems complying with the American Society of Heating, Refrigerating and Air-Conditioning Engineers' ASHRAE 15, "Safety Code for Mechanical Refrigeration."
- H. NSF Standards: Comply with applicable NSF International (NSF) standards and criteria and provide NSF Certification Mark on each equipment item, unless otherwise indicated.
- I. ANSI Standards: Comply with applicable ANSI standards for electric-powered appliances; for piping to compressed-gas cylinders; and for plumbing fittings, including vacuum breakers and air gaps, to prevent siphonage in water piping.
- J. SMACNA Standard: Where applicable, fabricate food service equipment to comply with the Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) "Kitchen Equipment Fabrication Guidelines," unless otherwise indicated.
- K. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Review methods and procedures related to food service equipment including, but not limited to, the following:
 - 1. Review access requirements for equipment delivery.
 - 2. Review equipment storage and security requirements.
 - 3. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - 4. Review structural loading limitations.
 - 5. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver food service equipment as factory-assembled units with protective crating and covering.
- B. Store food service equipment in original protective crating and covering and in a dry location.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of food service equipment installation areas by field measurements before equipment fabrication and indicate measurements on Shop Drawings and Coordination Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish required dimensions and proceed with fabricating equipment without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate equipment layout and installation with other work, including light fixtures, HVAC equipment, and fire-suppression system components.
- B. Coordinate location and requirements of service-utility connections.

1.9 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. Refrigeration Compressor Warranty: Submit a written warranty signed by manufacturer agreeing to repair or replace compressors that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
 - 1. Breakage.
 - 2. Faulty operation.
- C. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless-Steel Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304, stretcher leveled, and in finish specified in "Stainless-Steel Finishes" Article.
- B. Stainless-Steel Tube: ASTM A 554, Grade MT-304, and in finish specified in "Stainless-Steel Finishes" Article.
- C. Zinc-Coated Steel Sheet: **ASTM A 653, G115 (ASTM A 653M, Z350)** coating designation; commercial quality; cold rolled; stretcher leveled; and chemically treated.
- D. Zinc-Coated Steel Shapes: **ASTM A 36 (ASTM A 36M)**, zinc-coated according to ASTM A 123 requirements.
- E. Plywood and Lumber: Provide plywood and lumber as specified in Division 6 Section "Rough & Finish Carpentry"
- F. Sealant: ASTM C 920; Type S, Grade NS, Class 25, Use NT. Provide elastomeric sealant NSF certified for end-use application indicated. Provide sealant that, when cured and washed, meets requirements of Food and Drug Administration's 21 CFR, Section 177.2600 for use in areas that come in contact with food.
 - 1. Color: As selected by Architect from manufacturer's full range of colors.
 - 2. Backer Rod: Closed-cell polyethylene, in diameter larger than joint width.
- G. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), Class 1 (clear), Quality q3 (glazing select). Provide products complying with ANSI Z97.1, manufactured by horizontal (roller-hearth) process, and 6 mm thick, unless otherwise indicated. Provide exposed safety edges, if any, seamed before tempering.
- H. Plastic: Except for plastic laminate, provide plastic materials and components complying with NSF 51.
- I. Sound Dampening: NSF-certified, nonabsorbent, hard-drying, sound-deadening coating. Provide coating compounded for permanent adhesion to metal in **1/8-inch (3-mm)** thickness that does not chip, flake, or blister.

- J. Gaskets: NSF certified for end-use application indicated; of resilient rubber, neoprene, or PVC that is nontoxic, stable, odorless, nonabsorbent, and unaffected by exposure to foods and cleaning compounds.

2.2 ACCESSORIES

- A. Cabinet Hardware: Provide NSF-certified, stainless-steel hardware for equipment items as indicated.
- B. Casters: NSF-certified, standard-duty, stainless-steel, swivel stem casters with wheel diameter as scheduled; polyurethane tires with 1-inch (25-mm) tread width, and 200-lb (90-kg) load capacity per caster. Provide brakes on 2 casters per unit.

2.3 FABRICATION, GENERAL

- A. Fabricate food service equipment according to NSF 2 requirements. Factory assemble equipment to greatest extent possible.
- B. Welding: Use welding rod of same composition as metal being welded. Use methods that minimize distortion and develop strength and corrosion resistance of base metal. Provide ductile welds free of mechanical imperfections such as gas holes, pits, or cracks.
 - 1. Welded Butt Joints: Provide full-penetration welds for full-joint length. Make joints flat, continuous, and homogenous with sheet metal without relying on straps under seams, filling in with solder, or spot welding.
 - 2. Grind exposed welded joints flush with adjoining material and polish to match adjoining surfaces.
 - 3. Where fasteners are welded to underside of equipment, finish reverse side of weld smooth and undepressed.
 - 4. Coat unexposed stainless-steel welded joints with suitable metallic-based paint to prevent corrosion.
 - 5. After zinc-coated steel is welded, clean welds and abraded areas and apply SSPC-Paint 20, high-zinc-dust-content, galvanizing repair paint to comply with ASTM A 780.
- C. Fabricate field-assembled equipment prepared for field-joining methods indicated. For metal butt joints, comply with referenced SMACNA standard, unless otherwise indicated.
- D. Where stainless steel is joined to a dissimilar metal, use stainless-steel welding material or fastening devices.
- E. Form metal with break bends that are not flaky, scaly, or cracked in appearance; where breaks mar uniform surface appearance of material, remove marks by grinding, polishing, and finishing.
- F. Sheared Metal Edges: Finish free of burrs, fins, and irregular projections.
- G. Provide surfaces in food zone, as defined in NSF 2, free from exposed fasteners.
- H. Cap exposed fastener threads, including those inside cabinets, with stainless-steel lock washers and stainless-steel cap (acorn) nuts.
- I. Provide pipe slots on equipment with turned-up edges and sized to accommodate service and utility lines and mechanical connections.

- J. Provide enclosures, including panels, housings, and skirts, to conceal service lines, operating components, and mechanical and electrical devices including those inside cabinets, unless otherwise indicated.

2.4 STAINLESS-STEEL EQUIPMENT

- A. Apply sound dampening to underside of metal work surfaces, including work tables and similar units. Provide coating with smooth surface and hold coating 1 inch (25 mm) back from open edges for cleaning.
- B. Tables: Fabricate with reinforced tops, legs, and reinforced cross bracing to comply with referenced SMACNA standard, unless otherwise indicated, and as follows:
 - 1. Tops: Minimum 0.0781-inch- (1.984-mm-) thick stainless steel, unless otherwise indicated.
 - 2. Legs: 1-5/8-inch (41.3 mm) OD, minimum 0.0625-inch- (1.588-mm-) thick stainless steel with stainless-steel gusset and adjustable insert bullet-type feet with minimum adjustment of 1 inch (25 mm) up or down without exposing threads, unless otherwise indicated.
 - 3. Top Reinforcement: Provide minimum 0.0781-inch- (1.984-mm-) thick, stainless-steel reinforcing, unless otherwise indicated. Tops of work tables to be braced with 1-1/2" X 1-1/2" X 1/8" galvanized iron angle stud bolted to the underside of top and furnished with cadmium plated lock nut fasteners. Angles on work tables to run widthwise at each set of legs. Angles to be welded to gussets. Furnish two (2) angles under top lengthwise between legs. Angles on enclosed base tables and serving counters to be widthwise on a minimum of 20" centers. Furnish angle under top lengthwise on open side of counters between partitions. Angles to be welded to adjoining body flanges.
 - 4. Cross Bracing: 1-1/4-inch (31.75 mm) OD, minimum 0.0625-inch- (1.588-mm-) thick stainless steel, unless otherwise indicated. Crossrails to be furnished 10" off floor of same material as legs with joints between leg and crossrail notched, fully welded and ground smooth. Crossrails shall be extended and anchored to wall on all open pipe base tables abutting walls.

2.5 STAINLESS-STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
 - 1. Remove or blend tool and die marks and stretch lines into finish.
 - 2. Grind and polish surfaces to produce uniform, directional textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. Concealed Surfaces: No. 2B finish (bright, cold-rolled, unpolished finish).
- C. Exposed Surfaces: No. 4 finish (bright, directional polish).
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- E. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

2.6 FOOD SERVICE EQUIPMENT LIST:

ITEM NO. 1 - FREEZER (1 REQ'D)

Centaur Plus, Model CSD-1DF-TSI, or equal.

ITEM NO. 2 - REFRIGERATOR (1 REQ'D)
Centaur Plus, Model CSD-2DR-TSI, or equal.

ITEMS NO. 3 MICROWAVE OVEN (1 REQ'D)

Amana Commercial Microwave Oven, Model ACP Model RFS18TS, or equal

ITEM NO. 4 – MOBILE HEATED CABINET (1 REQ'D)

Metro Model C589-NDS-L, or equal

ITEM NO. 5 – ICE MAKER WITH BIN, CUBE-STYLE (1 REQ'D)

Scotsman Model CU3030MA-1, or equal

ITEM 6 – WORKTABLE (2 REQ'D)

ADVANCE TABCO KSS-246, (24" x 72"), or equal

ITEM 7 – UNDERCOUNTER REFRIGERATOR (1 REQ'D at COFFEE BAR 108)

Frigidaire Model FFBC4622QS, or equal

3.0 EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, service-utility connections, and other conditions affecting installation and performance of food service equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Examine roughing-in for piping, mechanical, and electrical systems to verify actual locations of connections before installation.

3.2 INSTALLATION, GENERAL

- A. Install food service equipment level and plumb, according to manufacturer's written instructions, original design, and referenced standards.
- B. Indicate field joints and methods of connection on Drawings. Correlate with NSF 2 requirements.
- C. Complete equipment field assembly, where required, using methods indicated.
 - 1. Provide closed butt and contact joints that do not require a filler.
 - 2. Grind field welds on stainless-steel equipment smooth, and polish to match adjacent finish. Comply with welding requirements in "Fabrication, General" Article.
- D. Install equipment with access and maintenance clearances according to manufacturer's written instructions and requirements of authorities having jurisdiction.
- E. Provide cutouts in equipment, neatly formed, where required to run service lines through equipment to make final connections.

- F. Except for mobile and adjustable-leg equipment, securely anchor and attach items and accessories to walls, floors, or bases with stainless-steel fasteners, unless otherwise indicated.
- G. Install cabinets and similar equipment on concrete or masonry bases in a bed of sealant.
- H. Install trim strips and similar items requiring fasteners in a bed of sealant. Fasten with stainless-steel fasteners at 48 inches (1200 mm) o.c. maximum.
- I. Install sealant in joints between equipment and abutting surfaces with continuous joint backing, unless otherwise indicated. Provide airtight, watertight, vermin-proof, sanitary joints.

3.3 PROTECTING

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure food service equipment is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 11452

SECTION 12304 – MODULAR LAMINATE CASEWORK

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and provisions of the contract including General Conditions, Supplementary Conditions, and Division 1, apply to this contract.

1.02 WORK INCLUDED:

- A. Furnish and install all high-pressure laminate casework and accessories as shown and listed on drawings and specified herein, including:
 - 1. Base and/or Wall Cabinets at locations indicated on Floor Plans and Interior Elevations.
 - 3. Filler panels, trim and accessories, as necessary for a complete casework installation.
- B. The Casework Subcontractor shall verify all critical building dimensions prior to fabrication of casework. The Casework Manufacturer shall re-engineer the casework arrangements to dimensions requiring 2-1/2" or less of filler at each end of wall-to-wall elevations, and to ensure all complete and satisfactory installation.
- C. Provide all labor for unloading, distribution, and installation of casework and related items as specified.
- D. Provide cutouts for electrical outlets.
- E. Provide caulking of casework and tops to walls.

1.03 WORK RELATED NOT INCLUDED:

- A. Rough Carpentry: Wood blocking within walls to adequately support casework.
- B. Finished Base, as scheduled on Drawings and specified in Division 9 Sections.
- C. Division 16: Electrical: Furnishing, installation, and final connections of wiring, conduit, and/or electrical items within casework (not indicated herein to be furnished under this Section), shall be performed by the Electrical Subcontractor in compliance with state and local codes.

1.04 STANDARD OF QUALITY:

- A. APPROVED MANUFACTURERS:
 - CASE SYSTEMS, INC.
 - STEVENS INDUSTRIES
 - LSI
 - TMI

1. Casework of other nationally recognized Casework Manufacturers will be considered, subject to submission in accordance with the Prior Approval section of these specifications. Proposed manufacturers' products shall be equal in construction and design, according to Drawings and as specified herein.
 2. Other proposed manufacturers shall provide proof of AWI membership and continuous AWI Section 400 and 1600 Premium Grade Compliance.
 3. Any manufacturers or dealerships requesting pre-bid approval must show proof of similar projects provided on a continual basis over the last 5 years, by the manufacturer or dealership under current ownership during the past 5 years.
- B. Casework shall meet or exceed the following general requirements, including, but not limited to the following:
- C.
1. Cabinets must be Mod-Eez fastener or dowel-pinned construction. No stapled, or screwed cabinets will be permitted.
 2. All cabinet backs must be captured, 4 sides and be ½" thick particleboard with thermos-fused or GP28 laminate finish. No stapled backs or glued backs with shims permitted.
 3. No cabinet sides to floor. Separate, factory attached plywood base only.
- D. Laminate selections shall be available in a minimum of 300 solid or 50 wood grain colors, as well as 3 thermo-fused interior colors and 75, 3MM edge colors. A maximum of 2 colors per project will be available.
- 1.05 SUBMITTALS:
- A. Comply with Division 1.
 - B. Product Data: Submit the Casework Manufacturers catalog showing casework construction details, and materials and hardware used.
 - C. Submit exterior systems in specified colors.
 - D. Submit interior systems in specified colors.
 - E. Submit five sets of shop drawings showing:
 1. Construction options selection sheet.
 2. Small scale floor plan showing casework in relation to the building.
 3. Large scale elevations and plan views.
 4. Cross-section, service runs, blocking locations and sinks centerlines.
 - F. Shop drawings shall be submitted within 21 days of casework contract award.
- 1.06 **WARRANTY:**
- A. **All products must be warranted unconditionally for a period of five (5) years on all parts.**

PART II – PRODUCTS

2.01 GENERAL:

- A. Decorative laminated casework shall be Case Systems as specified or approved equal with the following features:
1. ½" Thick Inset and Captured Cabinet Backs
 2. Reveal Overlay Door and Drawer Fronts
 3. Five Knuckle Institutional Grade Hinges
 4. PVC edges applied with hot melt glue, 3MM PVC at Door Edges
 5. Thermo-fused Laminate Interior which exceeds NEMA LD3-1995 for GP-28 Performance
 6. GP-28 Laminate Exterior
 7. Separate and Factory attached Plywood Base Construction
 8. M-3 engineered board for all cabinet components
 9. "Balanced" high pressure laminates applied with rigid PVA glue
 10. Casework shall be independently tested to meet the following minimum performance values:

Base Unit Racking	1460 lb/f
Base Front Joint Loading	725 lb/f
Wall Unit Racking	1600 lb/f
Wall Unit Static Load	2500 lb/f
- B. Color and finish selections shall be as follows:
1. Color and finish selections shall be selected by Architect from the full range of colors and finishes offered by laminate manufacturer.
 2. Open and Closed Interiors shall be white, beige (almond) or grey thermos-fused laminate.

2.02 MATERIALS:

- A. Exterior vertical surfaces:
1. All finished end panels, separate; attachable back panel shall be surfaced with .028" thick high-pressure decorative laminate conforming to NEMA LD3-Latest Edition, GP-28.
 2. Laminate patterns, wood grains, and solid colors will be selected from Formica, Wilsonart, Nevamar or Pionite current non-specialty, non-premium grade offering in laminate manufacturer's standard suede, textured or matte finish. All standard laminate patterns, wood grains and solid colors will be available for both cabinet and countertop selections.
 3. Where wood patterns are selected, grain direction shall be vertical on doors, end panels, and exposed backs; horizontal on drawer fronts and aprons.
 4. All exterior vertical high-pressure laminate panels shall be balanced with textured .020" thick high-pressure cabinet liner conforming to NEMA Standard LD3-Latest Edition, CL-20. Surface texture shall be similar to exterior finish.

B. Hardware:

1. Pulls: (Epoxy Coated Wire)
 - a. One 128 mm wire; finish as selected by Architect.
2. Hinges: (Epoxy Coated 5 Knuckle)
 - a. Hinges shall be epoxy-coated steel, five-knuckle hospital-tip institutional grade quality with .87" diameter tight pin. Residential, kitchen type pivot, plain butt, or hinges with removable pins "SHALL NOT BE ACCEPTABLE". Each hinge shall be secured with a minimum of nine No. 8 screws. Hinge shall permit door to swing 270 degrees without binding. Doors less than 48" in height shall have two hinges. Doors over 48" in height shall have three hinges. Finish as selected by Architect.
3. Drawer Slides:
 - a. Standard Drawer: Self-closing, bottom mount epoxy coated with captive roller and positive in stop. Slide shall have 100# rating, must be self-closing within last 3% of travel and must prevent drawer fronts from contacting the cabinet body.
4. Door Catches:
 - a. Base and Wall Cabinets: 7-pound magnetic catch.
5. Adjustable Shelf Supports:
 - a. Shelf supports shall be injected molded clear plastic, with a double pin engagement 32 mm on center and shall have 3/4" and 1" anti-tip locking tabs. Capable of supporting 125 pounds each.
6. Locks:
 - a. Provide manufacturer's standard drawer and/or door locks where indicated on drawings and schedule.

2.03 CONSTRUCTION:

- A. All cabinet body components shall be secured utilizing concealed interlocking mechanical fasteners or Dowel Pin as approved by the Architectural Woodwork Institute Quality Standard, 8th Edition – 2003 Sections 400 A-T-12, 400 B-T-10 and 1600-T-11. Also as approved by the Woodwork Institute of California's "Manual of Millwork" Section 15-6.2.195. They shall be specifically designed for use in joining particleboard panels.
- B. All joints are tight fitting and will not rupture or loosen due to:
1. Dimensional changes in the particleboard.
 2. Racking of casework during shipment and installation.
 3. Normal use.
 4. All fastening devices and screws shall be treated to deter or resist corrosion.
- C. Construction features – All cabinets:
1. All structural components shall be 3/4" thick with balanced surfaces.
 2. All back panels shall be:
 - a. 1/2" thick surfaced both sides for balanced construction.
 - b. Fully captured on both sides and bottom: face-mounted, stapled backs are not acceptable.

3. Mounted stretchers are $\frac{3}{4}$ " thick structural components fastened to end panels by mechanical fasteners, and are concealed by the cabinet back.
4. When the rear of a cabinet is exposed, a separate finished $\frac{3}{4}$ " thick decorative laminate back panel shall be applied.
5. Exterior Grade Plywood core individual bases, factory applied to base and tall cabinets shall support and carry the load of the end panels, and the cabinet bottom, directly to the floor. The base shall be let in from the sides and back of the cabinet to allow cabinets to be installed tightly together and tight against a wall. There shall be a front to back center support for all bases over 30" wide.
6. A 5mm diameter row hole pattern 32mm (1-1/4") on center shall be bored in cabinet ends for adjustable shelves. This row hole pattern shall also serve for hardware mounting and replacement and/or relocation of cabinet components.
7. Adjustable shelves shall be M-3 engineered board core with balance surfaces and have a nominal 1mm (.020") thick PVC front edge.
 - a. Adjustable shelves 36" and over shall be 1" thick.
 - b. All adjustable shelves in open cabinets shall be 1" thick.
8. Fixed interior components such as fixed shelves, dividers, and cubicle compartments shall be full $\frac{3}{4}$ " thick M-3 engineered board core attached with concealed interlocking mechanical fasteners.

2.04 PERFORMANCE:

A. Laminates:

1. "High Pressure Laminates" shall meet the definition and performance requirements of NEMA LD3-1991. Vertical grade laminate shall be GP-28 balanced with a minimum grade of CL-20. Countertops shall be GP-50 or PF-42 for Post-Formed Tops. Both provided with proper balancing laminate.
2. Thermo-fused laminate shall meet the performance requirements of NEMA LD3-1991 for GP-28. Panel manufacturer shall provide published specification.
3. Core material shall be engineered board meeting ANSI-A208. 1-lasted, M-3 Industrial Grade.
4. All high-pressure laminate must be laminated using a PVA adhesive, set under pressure, resulting in a rigid glue line. Contact adhesives shall not be used.

PART III – EXECUTION

3.01 SHIPPING:

- A. All casework shall be blanket wrapped and delivered to the storage site in furniture vans.
- B. General Contractor shall provide adequate roadways and access for delivery vans (Tractor Trailers) to within 40 feet of the building. General contractor will also provide adequate dry pathway to the building from the delivery van.

3.02 CASEWORK INSTALLATION

- A. Casework shall not be delivered or stored at the job site until building has become adequately dry and secure. All overhead work (Except Ceiling Tiles) must be complete. The ambient relative humidity must be maintained between 25% and 55% prior to delivery and through the life of the installation.
- B. Installation shall be by Casework Manufacturers authorized representative.
- C. Casework shall be installed plumb and true, and is to be securely anchored in place. Scribe casework fillers as necessary for a tight fit.
- D. Adjustable Shelf Units shall be securely fastened to horizontal blocking or to concrete block, not to plaster, lath, or wallboard. Reinforcement of stud walls shall be provided to appropriate trade during erection of walls. Casework Manufacturer shall accurately locate blocking requirements on shop drawings.
- E. Installation to follow AWI Division 1700, Eighth Edition Guidelines.

3.03 CLEANING AND PROTECTION BY CASEWORK CONTRACTOR:

- A. Wipe out cabinets interiors to remove dirt and dust. Remove pencil or other marks, excess adhesive, etc. from cabinets. Remove all packaging, scraps, and debris resulting from casework installation activities.
- B. PROTECTION AND FINAL CLEANING OF CASEWORK IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

END OF SECTION 12304



SECTION 15000- TABLE OF CONTENTS PLUMBING AND FIRE PROTECTION

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END OF TABLE OF CONTENTS – PLUMBING AND FIRE PROTECTION

SECTION 15401 – GENERAL PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes general plumbing requirements. Applies to all Division 15400 sections, except Section 15450's (Fire Protection).

1.02 DEFINITIONS

- A. "Provide" means to furnish and install, complete and ready for operation.

1.03 REFERENCES

- A. AGA: American Gas Association.
- B. ANSI: American National Standards Institute, Inc.
- C. ASHRAE: American Society of Heating, Refrigeration, and Air Conditioning Engineers.
- D. ASME: American Society for Mechanical Engineers.
- E. ASSE: American Society of Sanitary Engineers.
- F. ASTM: American Society of Testing and Materials.
- G. AWWA: American Water Works Association.
- H. CISPI: Cast Iron Soil Pipe Institute.
- I. FM: Factory Mutual.
- J. NAIMA: North American Insulation Manufacturers Association.
- K. NEMA: National Electrical Manufacturers Association.
- L. NFPA: National Fire Protection Association.
- M. NSF: National Sanitation Foundation.
- N. MSS: Manufacturers Standardized Society of the Valve and Fittings Industry.
- O. PDI: Plumbing and Drainage Institute.
- P. UL: Underwriters Laboratories, Inc.

1.04 REGULATORY REQUIREMENTS

- A. Comply with current edition, unless otherwise noted, of the following codes and standards:

1. ANSI B31.9 – Building Services Piping.
2. ADA – American’s with Disabilities Act.
3. ASME – Boiler and Pressure Code.
4. NFPA 30 – Flammable and Combustible Liquids Code.
5. NFPA 31 – Installation of Oil-Burning Equipment.
6. NFPA 54 – National Fuel Gas Code.
7. NFPA 70 – National Electrical Code.
8. NFPA 96 – Standards for Ventilation Control and Fire Protection of Commercial Cooking Operations.
9. NFPA 101 – Life Safety Code.
10. IBC – International Building Code with Fire, Mechanical, Plumbing, and Gas Codes; 2009 Edition.
11. International Energy Conservation Code: 2006 Edition.
12. Local Health Department.

B. Permits, Licenses, Inspections and Fees:

1. Obtain and pay all permits, licenses, inspections and fees, and comply with all rules, laws and ordinances pertaining to the Contractor’s portion of the Work.
2. Obtain and pay for certificates of required inspections, and file certificates with Owner.

1.05 PRODUCT REQUIREMENTS

A. Provide new standard, materials throughout.

B. Multiple items of similar equipment shall be the product of the same manufacturer.

C. Substitutions:

1. Comply with the provisions of Division 1, Section “Product Requirements” and the following.
2. When several manufacturers are named in the specifications, the corresponding products and models made by the specified manufacturers will be accepted and Contractor may base his bid on any one of those products. However, if the Contractor’s bid is based on products other than the scheduled or specified **basis of design**, it shall be understood that there will be no extra cost involved whatsoever, and the effect on other trades has been included in the Contractor’s proposal. Coordination with other trades for

substituted equipment or use of products other than the named basis of design shall be the responsibility of the Contractor furnishing the equipment.

3. The basis of design manufacturer's equipment has been used to determine space requirements. Should another approved manufacturer's equipment be used in preparing proposals, Contractor shall be responsible for determining that said equipment will fit space allocated. Submission of shop drawings or product data on such equipment shall be considered as indicating that the Contractor has reviewed the space requirements and the submitted equipment will fit the space allocated with due consideration given to access required for maintenance and code purposes.
4. The basis of design manufacturer's equipment and scheduled Plumbing equipment electrical requirements have been used to coordinate the electrical requirements of the plumbing equipment with the electrical systems serving that equipment.
 - a. Contractor shall coordinate the electrical requirements of the equipment actually furnished on this project and provide the electrical systems required by that equipment at no additional cost to the Owner.
 - b. Equipment of higher or lower electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified at no additional cost to the Owner.
 - c. Prior to approval of submittals of plumbing equipment with electrical requirements that are greater or lower than those shown on the Drawings, Contractor shall submit letter verifying that required changes to the electrical system, serving the specific piece of equipment in question, have been coordinated with the electrical contractor. Letter to be included with the associated equipment submittal, addressed to the Architect with a copy to the electrical engineer.
 - d. If minimum energy ratings or efficiencies are specified, equipment shall comply with specified requirements.
5. Each Bidder may submit to the Architect a list of any substitutes which he proposes to use in lieu of the equipment or material named in the specifications with a request for the approval of proposed substitutes. To be considered, such requests must be delivered to the office of the Architect not later than 10 days prior to bid due date. The submittal shall include the following:
 - a. Specific equipment or material proposed for substitution giving manufacturer, catalog and model number.
 - b. All performance and dimensional data necessary for comparison of the proposed substitute with the equipment or material specified.
 - c. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require.

6. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.

1.06 SUBMITTALS

- A. Submit under provisions of Division 1, Section "Submittal Procedures" and the following.
- B. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment which are to be provided under the 15400 Sections of Division 15.
 1. List shall be complete with manufacturer names, catalog number, dimensions, specifications, rating data and options utilized. Capacities shall be in the terms specified.
 2. Call attention to deviations from specified items as to operation and physical dimensions.
 3. Include performance curves for pumps.
 4. Final equipment orders shall not be placed until submittals have been returned marked "No Exceptions Noted" or "Make Corrections Noted."
 5. Bind all equipment submittals and provide index tab for each type of equipment. Submit all at one time. Reserve two sets for project Close-Out Documents.

1.07 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm experienced in installation of systems similar in size and complexity to those required for this project, plus the following:
 1. Acceptable to, or licensed by, manufacturer.
 2. Not less than 3 years experience with systems.
 3. Successfully completed no less than 5 comparable scale projects using systems similar to these for this project.
 4. Current Master Plumbing's Certificate and Master's Gas Certificate issued by the State, County, and City in which the work occurs.

1.08 SUMMARY OF WORK

- A. Scope: Provide all labor, materials, equipment and services necessary for the completion of all plumbing work shown or specified, except work specified to be done or furnished by others, complete and ready for operation.
- B. Equipment Furnished by Others:
 1. Connect to all equipment shown on plumbing drawings that require plumbing connections.

2. Provide piping, shut-off valves, and unions required for a complete installation.
3. Equipment furnished by others include:
 - a. Casework.
 - b. Ice machines.
 - c. Pantry units.
 - d. Coffee makers.

1.09 DRAWING INTERPRETATION AND COORDINATION

- A. Drawings are intended to show size, capacity, approximate location, direction and general relationship of one phase to another, but not exact detail or arrangement.
- B. Do not scale drawings for location of system components. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings and conditions existing in the field and lay out work so as to fit in with ceiling grids, lighting and other parts.
- C. Make minor adjustments in the field as required to provide the optimum result to facilitate ease of service, efficient operation and best appearance.
- D. Where doubt arises as to the meaning of the drawings and specifications, obtain the Architect's written decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.
- E. Refer to Architectural Drawings for all dimensions.

1.10 PROJECT / SITE CONDITIONS

- A. Visiting Site: Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.
- B. Determine sizes, locations, and inverts of existing and new utilities near site.
- C. Cause as little interference or interruption of existing utilities and service as possible. Schedule work which will cause interference or interruption in advance with Owner, authorities having jurisdiction, and all affected trades.

1.11 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit under provisions of Division 1, Sections "Closeout Procedures" and "Project Record Documents" and the following.
- B. Record Drawings:

1. Keep accurate record of corrections, variations, and deviations, including those required by change orders to the Plumbing drawings.
 2. Accurately show location, size and elevation of new exterior work dimensioned from permanent structure.
 3. Record changes daily on a set of prints kept at the job site.
 4. Submit prints marked as noted above to Architect for review prior to request for final payment.
 5. Marked prints will be returned to Contractor for use in preparing Record Drawings.
 6. Engineer will use marked up drawing showing as-built conditions provided by Contractor to prepare Record Drawings.
- C. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
1. Record drawings – plumbing piping (reproducible) and electronic files in AutoCAD.
 2. Equipment Submittal Data (2).
 3. Equipment operating and maintenance manuals (2).
 4. Equipment warranty dates and guarantees (2).
 5. Pressure vessel certificates (2).
 6. Certificate of Disinfection of domestic water lines.
 7. List of Owner's Personnel who have received operating and maintenance instructions.
 8. Install valve charts and valve location plans in main mechanical room. (See Division 15, Section "Plumbing Identification").
 9. Submit factory start-up/field reports for:
 - a. Domestic water heaters.

END OF SECTION 15401

SECTION 15403 - BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

- A. Description of common piping, equipment, materials and installation for Plumbing systems.
- B. This Section includes the following:
 - 1. Piping materials and installation instructions common to most Plumbing piping systems.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Sleeves.
 - 5. Concrete.
 - 6. Grout.
 - 7. Escutcheons.
 - 8. Access doors - Building.
 - 9. Protection and cleaning of equipment and materials.
 - 10. Flashing
 - 11. Workmanship.
 - 12. Cutting and patching.
 - 13. Excavation, trenching and backfilling.
 - 14. Connection to existing systems.
 - 15. Piping systems installation - Common Requirements.
 - 16. Equipment installation - Common Requirements.
 - 17. Painting and finishing.
 - 18. Supports and anchorages.

1.02 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. 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.
- F. The following are industry abbreviations for plastic materials:
 - 1. CPVC: Chlorinated polyvinyl chloride plastic.
 - 2. PE: Polyethylene plastic.

3. PVC: Polyvinyl chloride plastic.

1.03 SUBMITTALS

- A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Escutcheons.
4. Access doors - building.

1.04 INFORMATIONAL SUBMITTALS

- A. Shop Drawings: For multi-story buildings, submit detailed drawings of the floor penetration sleeve sizes and locations, including the following information:

1. Fully dimensioned off column lines with location respective to adjacent walls shown.
2. Sleeve size.
3. Pipe size and insulation thickness.
4. Pipe service.

1.05 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 to prevent entrance of dirt, debris, and moisture. If pipes do not ship with end caps, cover ends of pipe stored on site with 6 mil plastic.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.06 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for Plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves and inserts in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate installation of building access doors for Plumbing items requiring access that are concealed behind finished surfaces.
- D. Electrical Characteristics for Plumbing Equipment:
1. Coordinate electrical system installation to match requirements of equipment actually furnished on this project.

2. If minimum energy ratings or efficiencies are specified, equipment shall comply with these requirements.
3. Include a letter with the respective equipment submittal from the electrical contractor and approved by electrical design consultant, detailing changes to the electrical system required to accommodate changes in the power distribution system to accommodate Plumbing equipment that has different electrical power requirements from that equipment used as basis of design, or power provisions, as shown on the electrical drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 1. Manufacturers: Subject to compliance with requirements. Provide products by one of the following:

2.02 PIPE, TUBE AND FITTINGS

- A. Refer to individual Division 15 Plumbing Piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.03 JOINING MATERIALS

- A. Refer to individual Division 15 Plumbing Piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless 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. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.
- G. Solvent Cements for Joining PVC Piping: ASTM D2564. Include primer according to ASTM F656.
 - 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Model 24).
 - 3. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.04 TRANSITION FITTINGS

- A. Plastic-to-Metal Transition Fittings:
 - 1. For pipe sizes NPS 2 and smaller: PVC or CPVC, Schedule 80, one-piece fitting; one end with threaded brass insert, and one solvent-cement socket or threaded end.
 - 2. For pipe sizes larger than NPS 2: Flanged joints.
- B. Fitting-Type Transition Couplings:
 - 1. Manufactured piping coupling or specified piping system fitting.

2.05 DIELECTRIC FITTINGS

- A. Dielectric Nipples:
 - 1. Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.
 - d. Victaulic Co. of America; Clearflow Dielectric Waterway Style 47.
 - 2. Zinc electroplated steel nipple with inert and noncorrosive, thermoplastic lining; treaded ends; and 300 psig minimum working pressure at 230 deg F. Ring-groove to lock liner to steel casing and provide indentifying roll marking.
- B. Dielectric Flanges:

1. Manufacturers:
 - a. Capital Manufacturing.
 - b. Central Plastics.
 - c. Watts.
 - d. Wilkins, a Zurn Company.
2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. End Connections: Solder-joint or thread copper alloy and thread ferrous.
5. Dielectric Flange Insulating Kits:
 - a. Non-conducting materials for field assembly or companion flanges.
 - b. Gasket: Neoprene or phenolic.
 - c. Bolt Sleeves: Phenolic or polyethylene.
 - d. Washers: Phenolic with steel backing washers.

2.07 SLEEVES

- A. Galvanized-Steel Sheet: 20 gauge minimum thickness; round tube closed with longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Firestopping Sealant: See Division 7 Sections "Through-Penetration Firestop Systems" and "Fire Resistive Joint Systems" for firestopping sealant requirements.
- D. Stuffing Insulation: Glass fiber type, non-combustible.

2.08 CONCRETE

- A. Nominal weight concrete (145 PCF) using Type I Portland Cement, 1-inch maximum size coarse aggregate to provide a minimum 28 day compressive strength of 3000 psi.

2.09 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink and non-metallic, dry hydraulic-cement grout.
 1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5000-psi, 28-day compressive strength.

2. Packaging: Premixed and factory packaged.

2.10 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

1. Finish: Polished chrome-plated.

2.11 ACCESS DOORS – BUILDING

- A. Manufacturers:

1. Bilco.
2. Milcor.
3. Nystrom.

- B. Construction:

1. Door: 14-gauge, cold rolled steel.
2. Frame: 16-gauge, cold rolled steel of configuration to suit material application.
3. Hinge: Concealed spring hinge.
4. Latch: Screwdriver cam latch.
5. Finish: Phosphate dipped and prime coated.
6. UL labeled when in fire-rated construction with rating to match construction.
7. Stainless steel (Type 304) shall be used in ceramic tile or glazed structural tile.

- C. Size: 16 inch x 16 inch minimum, as indicated on drawings, or as required to allow inspection, service, and removal of concealed items.

2.12 FLASHING

- A. Flexible Flashing: 47 mil thick sheet butyl compatible with roofing.

- B. Lead Flashing: Waterproofing, 5 lb/SF sheet lead.

- C. Pitch Cups: 20 gauge galvanized steel, minimum 8 inches deep, bases mitered and soldered and extending at least 4 inches horizontally.

- D. Shower Pans: Specified in Division 9, Section “Ceramic Tile.”

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. First class and in accordance with best practice. Work to be orderly, neat, appearance and performed by skilled craftsman.

- B. Poor or improper workmanship shall be removed and replaced as directed by the Architect without additional cost to the Owner or design professionals.

3.02 CUTTING AND PATCHING

- A. Comply with the requirements of other Divisions for the cutting and patching required to accommodate the installation of Plumbing work. Repair and finish to match surrounding.
- B. Architect's approval required before cutting any part where strength or appearance of finished work is involved.
- C. Openings are to be laid out and built-in, set sleeves and inserts and furnish detailed layout drawings to other trades in advance of their work.
- D. Core drill or saw cut openings in existing masonry construction.

3.03 EXCAVATION, TRENCHING AND BACKFILLING

- A. Provide trenching, excavation, backfilling necessary for performance of work, including excavation of rock and all other materials which may be encountered.
- B. Grade bottom of trenches evenly and excavate bell holes to insure uniform bearing for the full pipe length. Excavate minimum 6 inches below pipe. Refill cuts below grade with sand.
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel in accordance with requirements in Division 2. Section "Earthwork" no less than 95% compactancy. Backfill paved areas with sand or fine gravel compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe.
- D. Refer to Division 15, Plumbing Piping Sections for specific bedding and backfill requirements.
 - 1. For factory or field insulation or coated piping, the bedding shall be a minimum of 6 inches of sand. The first 12 inches of backfill above the pipe shall be sand.
- E. Restore existing pavement, curbs, sidewalks, sodding, bushes, etc., matching surroundings.
- F. Restore all pavement cuts to meet the requirements of the cuts of the local authority.

3.04 DEMOLITION:

- A. Refer to the Architectural Demolition Plans for areas to be demolished and remove all fixtures noted to be removed.
- B. All fixtures and equipment noted "To Be Removed" on the drawings shall remain the property of the Owner. If Owner decides against retention of any or all items this Contractor shall remove from the site.
- C. Where fixtures are removed, remove all abandoned or unused piping back to main or nearest active connection and cap or plug.
- D. When vent stack(s) thru roof(s) are abandoned leave existing vent stack thru roof in place, cut pipe and cap as close as possible to underside of roof deck.

- E. Coordinate all system shut down with Owner. Request shut down minimum 72 hours prior to scheduled shut down period. Do not shut down any system without approval of Owner. Perform shut down at premium time if required.
- F. Refer to Architectural Demolition Plans for fixtures to be removed.

3.05 CONNECTIONS TO EXISTING SYSTEMS:

- A. Make connections to existing systems only at time authorized, in writing, by Owner.
- B. Do not take system out of service during occupied working, office or school hours.
- C. Drain existing systems and fill, vent, test, balance and put existing systems into operation after connections have been made.
- D. Repair existing insulation at points of connection to existing work.

3.06 PIPING SYSTEMS INSTALLATION - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 15 Plumbing Sections specifying piping systems.
- B. Drawings, 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 unless deviations to layout are approved on Shop Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and in service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections. No mitering or notching for fittings permitted.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons where exposed, non-insulated piping penetrates walls, ceilings, and floors in finished spaces.

3.07 SLEEVES

- A. Sleeves are not required for core-drilled holes, or wall hydrants.
 - 1. In mechanical room floors and other potentially wet areas, provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
- B. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length so that sleeve extends out 1/2 inch from both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas, or other potentially wet areas, 1-1/2 inches above finished floor level. Caulk space outside of sleeves water tight.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3. Use the following sleeve materials:
 - a. Sleeves for Piping Through Concrete Beams, Concrete Walls, Footings, and Potentially Wet Floors: Steel pipe.
 - b. Sleeves for Piping Through Masonry Walls and Gypsum Board Partitions: Steel sheet sleeves 1/2 inch larger than pipe or pipe covering.
 - 4. Where piping penetrates non-rated equipment room wall, floors or roofs outside of a shaft, close off space between pipe or duct and adjacent work with stuffing insulation and caulk air tight.
 - 5. Above ground, non-rated, exterior wall penetrations: Seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
 - 6. Provide for continuous insulation wrapping thru sleeve.
 - 7. Seal space around the outside of sleeves with grout at masonry walls and floors and dry wall mud at gypsum board partitions.
- C. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

- D. Fire-Rated Penetrations: Where pipes pass through fire-rated and fire-resistive floors, walls, and partitions, install appropriately rated sleeves and firestopping sealant. Firestopping materials and installation methods are specified in Division 7 Sections "Through Penetration Firestop Systems" and "Fire Resistive Joint Systems".

3.08 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 15 Plumbing Piping Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. 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 unless dry seal threading is specified.
- G. Flanged Joints:
1. 125 Pound Cast Iron Flange (Plain Face): Mating flange shall have raised face, if any, removed to avoid overstressing the cast iron flange.
 2. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- H. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 2. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 3. PVC Non-pressure Piping: Join according to ASTM D 2855.
- I. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

3.09 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Wet Piping Systems: Install dielectric fittings to connect piping materials of dissimilar metals.

3.10 PIPE CLEANING

- A. Keep pipe clean and free of dirt. Keep caps on ends of pipe when it is stored on site and reinstall caps on ends of installed piping at the end of each day.

3.11 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.
- D. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with Contract Documents, obtain Architect's decision before proceeding.
- E. Install equipment to allow right of way for piping installed at a required slope.
- F. All equipment shall be firmly fastened in place:
 - 1. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
 - 2. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.

3.12 PAINTING AND FINISHING

- A. Except as specified below or noted on the Drawing, requirements for painting of Plumbing systems, equipment, and components are specified in Division 9 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

- C. Paint water pipe and insulation downstream of backflow preventor (non-potable water) to termination point, or to connection with mechanical system piping, yellow.
- D. Painting of mechanical piping:
 - 1. The following piping within boiler and chiller room shall be painted in its entirety under Division 9: Painting. Color codes are listed here for information only.
 - a. Domestic Cold Water: Dark Blue, Metalatex B42L4.
 - b. Domestic Hot Water: Rose Red, Metalatex B42 (mix of R6 and W101).
 - 2. Should there be a conflict of colors in existing installations, contact the Architect.

3.13 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" requirements.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.14 GROUTING

- A. Mix and install grout for Plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

3.15 ACCESS DOORS – BUILDING

- A. Provide access doors in wall and inaccessible ceilings to allow access to service and maintain concealed Plumbing equipment, valves, etc.
- B. Coordinate installation of access doors with Divisions responsible for Building System in which panels are being installed.

3.16 FLASHING

- A. Provide flexible flashing and metal counter-flashing where pitch cups and piping penetrate weather or waterproofed walls, floors and roofs.
- B. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.
- C. Flashing for vent and soil pipes through the roof and roof drains specified under Division 7.
- D. Flashing floor drains and floor sinks in floors with topping over finished area with lead, 10-inches clearance sides with minimum 36x36 inch sheet size. Fasten flashing to drain clamp device.
- E. Seal floor and shower drains water tight to adjacent materials.

3.17 PROTECTION AND CLEANING OF EQUIPMENT, FIXTURES, AND MATERIALS

- A. Equipment, fixtures, and materials shall be carefully handled, properly stored, and protected from weather, dust-producing procedures, or damage during construction.
- B. At completion of all work, thoroughly clean, exposed materials (pipe, etc.), equipment, and fixtures and make ready for painting.

END SECTION 15403

SECTION 15405 - PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following plumbing identification materials and their installation:
 - 1. Pipe markers.
 - 2. Valve tags.
 - 3. Valve schedules.
 - 4. Equipment labels.
 - 5. Warning signs and labels.

1.02 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Valve numbering scheme.
- C. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals.

1.03 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.04 COORDINATION

- 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 location of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
 - 1. Colors: Comply with ASME A13.1, unless otherwise indicated.
 - 2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
 - 3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.

4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band pipe markers at least three times letter height and of length required for label.
 5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Pre-tensioned Pipe Markers: Pre-coiled semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

2.02 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme approved by Architect. Provide 5/32-inch hole for fastener.
1. Material: 3/32-inch thick laminated plastic with 2 black surfaces and white inner layer.
 2. Valve-Tag Fasteners: Brass wire-link chain, beaded chain or S-hook.

2.03 VALVE SCHEDULES

- A. Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.
 2. Frame: Extruded aluminum.
 3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

2.04 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
 2. Color Coding:

<u>System</u>	<u>Background Color</u>	<u>Letters</u>
Other equipment	Black	White

3. Temperatures up to 160 deg F.

4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 5. Letter shall be a minimum of 1/2" high. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 6. Fasteners: Stainless-steel self-tapping screws.
 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number.

2.05 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Yellow.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: Minimum 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information as indicated elsewhere in the specifications and on the Drawings.

PART 3 - EXECUTION

3.01 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 15 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.02 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
 1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pre-tensioned pipe markers. Use size to ensure a tight fit.

2. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.
- B. Locate pipe markers and color bands where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations as follows:
1. Near each valve and control device.
 2. Near each branch connection, excluding short takeoffs for fixtures. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations through walls, floors, ceilings, and non-accessible 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 along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 7. Label 2 psi gas piping at 5 foot intervals.

3.03 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:
1. Valve-Tag Size and Shape:
 - a. Cold Water: **2 inches square.**
 - b. Hot Water: **2 inches square.**
 - c. Gas: **2 inches square.**
 2. Valve-Tag Color:
 - a. Cold Water: **Black**
 - b. Hot Water: **White**
 - c. Gas: **Yellow**
 3. Letter Color:
 - a. Cold Water: **White.**
 - b. Hot Water: **White.**

- c. Gas: **White**.

3.04 VALVE-SCHEDULE INSTALLATION

- A. Mount valve schedule on wall in accessible location in each major equipment room.

END OF SECTION 15405

SECTION 15407 - PLUMBING SYSTEMS INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and Accessories.
- C. Equipment Insulation.
- D. Covering.

1.02 RELATED SECTIONS

- A. Division 7 – Firestopping.
- B. Division 15 – Section 15405 “Plumbing Identification.”
- C. Division 15 – Section 15410 “Plumbing Piping”: Placement of hangers and hanger inserts.

1.03 SUBMITTALS FOR REVIEW

- A. Section 15401: Procedures for submittals.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing insulation work with minimum 3 years experience.

1.05 REGULATORY REQUIREMENTS

- A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255 or UL 723.
- B. All insulation materials, adhesives, mastic and coating shall be asbestos free.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufactures for Fiberglass Insulation Materials:
 - 1. Owens-Corning.
 - 2. Certaniteed.
 - 3. Knauf.
 - 4. Manville Corporation

B. Acceptable Manufacturers for Foamed Plastic Closed Cell Elastometric Insulation Materials:

1. Armstrong AP.
2. Rubatex.

C. Acceptable Manufacturers for Adhesives, Mastics and Coatings:

1. Armstrong.
2. Benjamin Foster.
3. Childers.
4. Marathon.

2.02 GLASS FIBER PIPE INSULATION

A. Manufacturer: Owens-Corning Model SSL-11.

B. Insulation: ASTM C547; rigid molded, noncombustible.

1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum service temperature: 850 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket:

1. White kraft paper with glass fiber yarn, bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive:

1. Compatible with insulation.

F. Insulating Cement/Mastic:

1. ASTM C195; hydraulic setting on mineral wool.

2.03 FOAMED PLASTIC PIPE INSULATION

A. Manufacturer: Armaflex AP.

B. Insulation: ASTM C534; flexible cellular elastomeric insulation, pre-slit or slip on.

1. 'K' value: ASTM C177; 0.27 at 75 degrees F.
2. Minimum service temperature: -40 degrees F.
3. Maximum service temperature: 220 degrees F.
4. Moisture vapor absorption: ASTM D1056; 5.0 percent by weight.
5. Moisture vapor transmission: ASTM E96; 0.10 perm-inches.
6. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried adhesive, compatible with insulation.

D. Protective Coating: Weather resistant, compatible with insulation.

- E. Do not use in plenum unless meets ASTM E-84 flame spread rating of less than 25 and smoke density rating of less than 50.

2.04 JACKETS – PIPING AND EQUIPMENT

- A. PVDC Jacket for Indoor Applications: 4-mil thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E84.
- B. PVC Jacket.
 - 1. Jacket: ASTM D1784, one piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum service temperature: 0 degrees F.
 - b. Maximum service temperature: 150 degrees F.
 - c. Moisture vapor transmission: ASTM E96; 0.002 perm-inches.
 - d. Thickness: 20 mil.
 - e. Connections: Brush on welding adhesive.

2.05 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and jacketed outdoor use on below ambient services.
 - 1. Products:
 - a. Childers Products, Division of ITW; CP-35.
 - b. Foster Products Corporation, H.B. Fuller Company; 30-90.
 - c. ITW TACC, Division of Illinois Tool Works; CB-50.
 - d. Marathon Industries, Inc.; 590.
 - e. Mon-Eco Industries, Inc.; 55-40.
 - f. Vimasco Corporation; 749.
 - 2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
 - 5. Color: White.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that piping and equipment have been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with NAIMA National Insulation Standards.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. Fit pipe hangers over insulation.
- E. Inserts and Shields:
 - 1. Application: Protect insulated piping at hangers and supports with insulation shield. On pipe sizes over 2 inches, provide insert.
 - 2. Insulation Protection Shield: Galvanized steel formed in half circle to fit insulation. Length and gauge as follows:
 - a. Up to NPS 4: 12 inches long and 22 gauge.
 - b. NPS 6: 18 inches long and 22 gauge.
 - c. NPS 8 through 12: 24 inches long and 18 gauge.
 - d. NPS 14 and Large: 24 inches long and 16 gauge.
 - 3. Insulation-Insert Material: Water repellent treated, ASTM C533, Type I calcium silicate; or ASTM C552, Type II cellular glass of same thickness and vapor barrier jacket specified for surrounding insulation. Insert shall be a minimum of 2 inches longer than the shield.
 - 4. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
 - 5. For Clevis Hangers: Insert shall cover lower 180 degrees of pipe.
 - 6. Option: At Contractor's option, insert may be factory fabricated Thermal Hanger Shield (insulation insert encased in sheet metal shield) equal to Pipe Shield, Inc. "Insulated Pipe Supports."
 - 7. Option: At Contractor's option, steel pipe saddles may be used on hot water pipe in lieu of insert and shield. Fill interior void of saddle with insulation that matches adjoining insulation.

- F. Continue insulation through metal studs, walls, sleeves, pipe hangers, and other pipe penetrations. Finish firestopping at supports, protrusions, and interruptions. At fire separations, refer to Division 7 and Section 15410: Sleeves.
- G. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 GLASS FIBER PIPE INSULATION APPLICATION

- A. Provide vapor barrier jackets, factory or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding stapes 4 inch on center and vapor barrier mastic.
- B. Insulate fittings, joints and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- C. **Finish fittings exposed in equipment rooms, boiler rooms and in finished spaces with vinyl acrylic mastic over glass fab.**
- D. For hot piping do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

3.04 FOAMED PLASTIC PIPE INSULATION APPLICATION

- A. Pipe insulation may be seamless insulation slipped over piping before erection or may be slit longitudinally and installed over erected pipe.
- B. Fabricate fittings from mitered sections of pipe insulation.
- C. Cement all joints and seams per manufacturer's instructions.

3.05 SCHEDULES - PIPING

A. Plumbing Piping:

1. Domestic Cold Water, Above Grade:

a. Glass Fiber Pipe Insulation

- 1) All pipe sizes: 1 inch thick.
- 2) Pipes located in walls armaflex: ½ inch thick.

b. Foamed Plastic Pipe Insulation

- 1) All pipe sizes: 1 inch thick.
- 2) Pipes located in walls armaflex: ½ inch thick.

2. Domestic Hot and Recirculating Water Interior, Above Grade:

- a. Glass Fiber Pipe Insulation
 - 1) All pipe sizes: 1 inch thick.
 - 2) Pipe located in walls: ½ inch thick.
- b. Foamed Plastic Pipe Insulation
 - 1) All pipe sizes: 1 inch thick.
 - 2) Pipes located in walls armaflex: ½ inch thick.

3.06 INSTALLATION – EQUIPMENT INSULATION GENERAL

- A. Install in accordance with NAIMA Insulation Standards.
- B. Factory Insulated Equipment: Do not insulate.
- C. Exposed Equipment: Locate insulation and cover seams in least visible locations.
- D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires or bands.
- E. Fill joints, cracks, seams and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.
- F. Insulated equipment containing fluids below ambient temperature: Insulate entire system.
- G. Finish insulation at supports, protrusions, and interruptions.
- H. Equipment in Mechanical/ Boiler Rooms or Finished Spaces: Finish with canvas jacket.
- I. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
- J. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

END OF SECTION 15407

SECTION 15410 - PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, valves for the following piping systems:
 - 1. Sanitary, waste and vent piping.
 - 2. Domestic, hot and cold water piping.
 - 3. Natural gas piping.
 - 4. Fire protection piping.
 - 5. Valves and specialties.

1.02 RELATED SECTIONS

- A. Section 15401 – General Plumbing Requirements.
- B. Section 15403 – Basic Plumbing Materials and Methods.
- C. Section 15405 – Plumbing Identification.
- D. Section 15407 – Plumbing Systems Insulation.

1.03 SUBMITTALS FOR REVIEW

- A. Division 1 – Submittals and Section 15401: Procedures for submittals.
- B. Provide product data on the following:
 - 1. Pipe materials, pipe fittings and accessories.
 - 2. Manufacturers catalogue data and cut sheets on all fixtures and equipment.
 - 3. Valve data and ratings.
- C. Manufacturer's drawings of listed closing methods to be used to close penetrations through rated assemblies.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with the City of Glencoe, Alabama, codes and standards.
- B. Perform sanitary sewer work beyond 30 inch of building in accordance with County Standards.
- C. Valves: Manufacturer's name and pressure rating marked on valve body.

PART 2 - PRODUCTS

2.01 SANITARY WASTE AND VENT PIPING:

- A. Waste and vent piping to be Schedule 40 PVC plastic pipe.
- B. Copper DWV Tube:

1. Pipe: ASTM B306, DWV.
2. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
3. Joints: 50-50, ASTM B32, solder, Grade 50B.

C. PVC Pipe:

1. Pipe: ASTM D1785, Schedule 40 and ASTM D2265.
2. Fittings: ASTM D2465, PVC.
3. Joints: ASTM D2855, solvent weld with ASTM F-656 purple primer and ASTM D2564 solvent cement.
4. Use heavy duty no -hub clamps (Mission or Husky), when transitioning from cast iron to PVC
5. Foam Core PVC will not be allowed. Solid wall pipe only.
6. Pipe and Fittings by one manufacturer.

2.02 WATER PIPING, BELOW SLAB ON GRADE OR BELOW GRADE

A. Water Piping less than 3 inch; copper tube;

B. Water piping: Copper tube.

C. Copper Tubing:

1. Pipe: ASTM B88, Type K soft copper.
2. Fittings: ASME B16.22 wrought copper and bronze.
3. Joints: "Sil-Fos".
4. Piping to be installed to minimize the number of joints below grade of or below slab on grade.
5. Encase all below ground copper piping in plastic sleeve or 1/2" unsplit foam insulation.

2.03 WATER PIPING, ABOVE GRADE

A. Water piping 4 inch and smaller, copper tube;

B. Water piping: copper tube.

C. Copper Tubing:

1. Pipe: ASTM B88, Type L, hard drawn.
2. Fittings: ASME B16.22, wrought copper and bronze.
3. Joints: ASTM B32, 95-5 solder, Grade 95TA, lead free with lead free flux.

D. Insulation:

1. Insulate all water piping (cold, hot and hot return) above slab on grade with 1" fiberglass insulation. Insulation thickness may be reduced to 1/2 inch walls. Foam type insulation may be used in concrete block walls. (Armaflex or approved equal)
2. Insulation shall be installed continuous through walls.
3. See Section 15407 of the specifications for insulation description.

E. Identification:

1. Identify all piping in accordance with Section 15405 of the specification.

2.04 NATURAL GAS PIPING, BELOW GRADE

A. Plastic Pipe:

1. Pipe: ASTM S-1248 polyethylene for grade P24, Class B (PE 2406).
2. Fittings: Injection molded as described in ASTM-D-2683 and ASTM D-3216 Federal Department of Transportation Title 49 Part 192 minimum safety regulations and API 15 LE for polyethylene lines.
3. Joints: Butt fused in accordance with manufacturers recommendations.
4. Trace all below grade pipeline with single strand #16 yellow insulated copper wire laid directly on top of piping prior to covering pipe extended above grade and wrapped around pipe at each termination point.

2.05 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe:

1. Pipe: ASTM A53 Schedule 40 black.
2. Fittings: ASME B16.3, malleable iron.
3. Joints: NFPA 54, threaded with Teflon tape applied to male threads only.

B. Copper Tubing:

1. Pipe: Type "L" ASTM B68 or B75, general purpose.
2. Fittings: ASME B16.22, wrought copper.
3. Joints: Flared or "Sil-Fos."

- C. All gas piping in the 2 psi system shall be labeled with plastic labels indicating 2 psi at the beginning of the system, at the end of the system and at intervals not exceeding six feet.

2.06 FLEXIBLE PIPE CONNECTIONS

- A. Stainless steel corrugated tubing with stainless steel wire braid.
- B. Working pressure 200 psi minimum.
- C. End connections 2" and smaller-male pipe threads, larger than 2" flanged.
- D. Manufacturers: Minnesota Flexible Corporation, Metaflex, Flexicraft and Hyspan.

2.07 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 Inches and Under:

1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

- B. Pipe Size Over 2 Inches:
 - 1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 - 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.08 PIPE HANGERS AND SUPPORTS

- A. Hangers:
 - 1. Hangers for Pipe Sizes ½ to 1-1/2 Inch: Carbon steel, adjustable swivel, split ring.
 - 2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 - 3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods or Unistrut multiuse channel.
 - 4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 - 5. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
 - 6. Vertical Support: Steel riser clamp.
 - 7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 8. Copper Pipe Support when applied directly to the copper piping: Copper steel ring, adjustable.
 - 9. Install hanger over insulation on insulated pipe with sheet metal saddle rolled on the ends centered in hanger. See Section 15407.
- B. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- C. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.
- D. For fasteners in existing concrete structures, use drilled in expansion anchors with load rating 150% greater than the pipe hanger rating. Note: Powder drive anchors are not acceptable.
- E. Beam Clamps: Grinnell Figure #229.

2.09 BALL VALVES

- A. Up to and including 2 inches:
 - 1. Manufacturers:
 - a. Watts Model LFB-6080 or LFB-6081, full port.
 - b. Nibco, Apollo, Milwaukee, Kitz.
 - 2. MSS-SP-110 Class 125, bronze body, chrome plated full port ball, ptfe seats and seals, blow-out proof stem and threaded ends.

- B. 2-1/2 and larger:
 - 1. Manufacturers:
 - a. Watts LFG-4000 Series.
 - b. Nibco Model T-580-70, S-580-70, T-FP-600N, or S-FP-600N.

2.10 OUTSIDE WATER MAIN VALVES

- A. Manufacturers:
 - 1. Stockham.
 - 2. American Darling
 - 3. Crane.
- B. Iron body, bronze trim, 200 psig WP, non-rising stem, double disc, and parallel seat. Provide cast iron or ductile iron access to grade with tee handle wrench.

2.11 SWING CHECK VALVES

- A. Up To and Including 3 Inches:
 - 1. Manufactures:
 - a. Nibco Model S-413-B.
 - b. Crane, Stockham, Milwaukee, Kitz.
 - 2. MSS SP-80, Class 125, bronze body and cap, bronze trim and seat, threaded ends.
- B. Larger than 3"
 - 1. Manufactures:
 - a. Nibco Model F-918-B.
 - b. Crane, Stockham, Milwaukee, etc.
 - c. MSS SP-71, Class 125, iron body, bronze trim flanged ends.

2.12 WATER PRESSURE REDUCING VALVES

- A. Provide water pressure reducing valve at the service entry on all buildings where main pressure is in excess of 80 psi. Set out pressure at 70 psi.
- B. Up To and Including 2 Inches:
 - 1. Manufactures:
 - a. Watts Model U5B.
 - b. Wilkins, Cash, Acme.

2. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, internal by-pass, inlet strainer, threaded ends with single union and ball valve upstream of strainer.
- C. Over 2 Inches:
1. Manufactures:
 - a. Watts Model ACV-115-74C.
 - b. Williams, Cash, Acme.
 2. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.
- D. Provide pressure gage (0-150 PSI) with needle valve stop on leaving side of pressure reducing valve.

2.13 NATURAL GAS VALVES

- A. Manufactures:
1. 2" and smaller:
 - a. Watts Series FBC-1, Conbraco Series GB-10, Nibco GB-1, GB-2, T-FP600.
 2. Larger than 2":
 - a. Rockwell 143 lubricated 175 psi.
 3. All gas valves shall be third party listed.

2.14 GAS PRESSURE REGULATOR

- A. System Regulator: Equal to American Meter Co. Model 1813B with built-in over pressure shut off, size and capacity as shown on drawings.
- B. Appliance Regulator: Equal to American Meter Company J-78 for sizes ½", ¾" and 1" and J-48 for sizes 1"-3".
- C. Regulator valves shall be full line size with capacity as shown on Drawings. Provide regulators with positive shut-off and vent limiting device. Where vent limiting devices are not acceptable (over 200 C.F.H.), pipe relief line to exterior one pipe size larger than vent discharge and elbow down with screened opening per ASME CSD-1 requirements. Provide pressure gauges on inlet and outlet side of all regulators.
- D. Gas regulators for building heating finned-tube boilers are specified to be provided with the boiler. Plumbing contractor to install and adjust regulator per regulator manufacturer's instructions. Provide pressure gauges on inlet and outlet side of all regulators. Where vent limiting devices are not acceptable (over 200 C.F.H.), pipe relief line to exterior, one pipe size larger than vent discharge connection and terminate with elbow down with screened opening per ASME CSD-1 requirements.

2.15 THERMOMETERS

- A. Lights actuated digital thermometer reading in degrees Fahrenheit. Provide with well for minimum 1" insulation.
- B. Weiss Vari-angle Digital Thermometer.

2.16 SLEEVES

- A. Refer to Division 15, Section "Basic Plumbing Materials and Methods" for requirements.

2.17 FIRE STOP SYSTEM

- A. All wall and floor penetrations are to be closed. Refer to the Arch. Life Safety Plans and close all openings with a U.L. Listed assembly compatible with the rating of the wall or floor being penetrated.
- B. Non-rated walls:
 - 1. Sheet rock joint compound may be used to seal opening. Insulation to be continuous through wall.
- C. For piping passing through sheet rock walls or partitions:
 - 1. Insulated pipe passing through 2 walls or partitions – Hilti FS605 with sleeve U.L. Listing #WL1056.
 - 2. Insulated pipe passing through 2 hour walls or partitions – Hilti FS611A with no sleeve, U.L. Listing #WL5029. Insulation to be continuous through sleeve.
- D. For piping passing through concrete floors, concrete walls or concrete block walls:
 - 1. Uninsulated Schedule 40 steel on copper pipe: Hilti #F5605 with sleeve, U.L. #CAT155.
 - 2. Insulated Schedule 40 steel on insulated copper pipe: Hilti #FS6114A, U.L. #CAT5045.
- E. For non-metallic piping passing through concrete floors, walls or concrete block.
 - 1. 2" and smaller piping: Hilti #FS611A, U.L. #CAT2062 or U.L. #CAT2065.
 - 2. Larger than 2": Hilti #FS611A with collar, U.L. #CAT095.

2.18 FLASHING

- A. Refer to Division 15, Section "Basic Plumbing Materials and Methods" for requirements.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Cut pipe square and ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.

3.02 PIPING INSTALLATION GENERAL

- A. Install in accordance with manufacturer's instructions.
- B. Provide dielectric fittings wherever jointing dissimilar metals.
- C. Make piping connections to equipment with flanges or unions.
- D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- E. Run piping concealed, except where specifically shown to be exposed.
- F. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- G. Group piping whenever practical at common elevations.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.
- I. Provide clearance in hanger and from structure and other equipment for installation of insulation and access to valves and fittings.
- J. Provide access where valve is not accessible. Provide minimum 18"x18" access doors at valves in hard ceiling.
- K. Establish elevations of buried pressure piping outside the building to ensure not less than 18 inches of cover.
- L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09900.
- N. Install chrome plated floor, wall and ceiling plates on all exposed piping passing through finished surfaces in finished spaces.
- O. Install bell and spigot pipe with bell end upstream.
- P. Install valves with stems upright or horizontal, not inverted.
- Q. Install water piping to ASME B31.9. PDI shock arrestors are required to be installed on all branchlines.

R. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, or in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors not acceptable).

S. Pipe Hangers and Supports:

1. Support horizontal piping as scheduled.
2. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
3. Place hangers within 12 inches of each horizontal elbow.
4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, trapeze hangers may be used.
7. Provide copper hangers and supports when applied directly to copper piping.
8. Prime coat exposed steel hangers and supports located outdoors, in crawl spaces, pipe shafts. Above suspended ceiling spaces is not considered exposed.
9. Provide hangers adjacent to motor driven equipment.
10. Support cast iron drainage and vent piping at every joint and minimum 5'-0" on center.
11. Support of all pipe, tubing and fixtures and equipment shall be accomplished by means of engineered products specified to each application. Makeshift, field devised methods of plumbing pipe supports, such as scrap wood, wire or duct tape are not allowed. These shall be HoldRite, B-Line, Sioux Chief or approved equal.

T. Provide pipe line markers and valve tags in accordance with other sections of the specifications.

U. Sleeves:

1. Refer to Division 15, Section "Basic Plumbing Materials and Methods" for requirements.

V. Flashing:

1. Refer to Division 15, Section "Basic Plumbing Materials and Methods" for requirements.

3.03 EXCAVATION AND BACKFILLING

- A. Refer to Division 15, Section "Basic Plumbing Materials and Methods" for requirements.

3.04 APPLICATION

- A. Install unions at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system.
- C. Install valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Provide check valves on discharge of water pumps.
- E. Provide flow indicators in water recirculating systems where indicated.

3.05 ERECTION TOLERANCES

- A. Slope all sanitary waste piping and storm piping at a minimum 1/8" per foot. Slope all sanitary sewer piping 2" and smaller below slab on grade at a minimum 1/4" per foot.
- B. Arrange all water piping to drain to low points and provide ball valve with plug at low point.

3.06 SANITARY, WASTE AND VENT SYSTEM

- A. Install vent stacks through roof. Terminate 12 inches above finish roof and minimum 10'-0" from HVAC roof top unit outside air intakes. Flashings for penetrations are under another section.
- B. Connect to site sanitary sewer approximately 5'-0" from building. Verify exact size, location and invert with Civil Drawings prior to beginning work.
- C. Connect to existing sanitary sewer where shown on drawings. Contractor shall confirm exact size, invert, location, and direction of flow prior to installing any new piping.
- D. Insulate all mechanical floor drain bodies and horizontal piping between drain and connection to stack on elevated floors.

3.07 WATER PIPING SYSTEM

- A. Connect to site water service approximately 5'-0" from building installed under another section. Verify with Civil drawings exact size and location of site water service.

3.08 NATURAL GAS PIPING SYSTEM

- A. Arrange with local gas company to provide new gas service complete with connection to gas main, service from main to meter and meter installation all per gas company's requirements. Include all costs associated with new meter and service.
- B. Provide regulators on each line serving gas appliance sized in accordance with equipment requirements. Regulators shall have vent limiting device as required by local code or shall be vented to the exterior. Provide pressure gauge on inlet and outlet side of all regulators.
- C. Install no gas piping beneath slabs on grade. Where gas pipe must be installed below building slabs, install in steel encasement with vent to atmosphere. See detail on drawings.
- D. Where gas piping is installed exposed on the roof, the piping shall be installed on Erico PP50H6 pipe pier supports with integral strut channel.
- E. Where piping installed out of doors, coat all piping and joints with Sherman Williams "TARGUARD" coal tar epoxy. Do not coat joints until after testing and inspection. Clean rust from pipe prior to applying coating.
- F. Install union plug valve or gas shut-off and dirt pocket at each piece of equipment.

3.09 FIELD QUALITY CONTROL

- A. Perform all tests as required by local codes. Contractor shall furnish testing equipment and keep a record of all testing listing tests made, results and those witnessing test. Include testing record in close out documents.
- B. If local codes are more stringent than the following, local codes shall govern.
- C. Sanitary, Waste, and Vent Water Systems:
 - 1. Test piping by stopping lower outlets and filling to 10 feet hydrostatic head for a minimum period of 15 minutes with all joints exposed throughout test. Stop all leaks and retest system until tight.
 - 2. Test all piping by stopping all outlets and applying 5 pounds per square inch of air pressure to the system for a period of 15 minutes. Stop all leaks and retest system until tight.
 - 3. Provide ball test on all piping 3" and larger. Three Tests are usually required by U.A. Facilities Dept.
- D. Domestic Water Piping:
 - 1. Hydrostatic test at 150 psig without pressure drop for 4 hours. Stop all leaks and retest system until free from leaks.
 - 2. Leave City pressure on system for duration of project.
- E. Natural Gas Piping:

1. Air pressure test at 25 psig without pressure drop for 4 hours.
2. Black steel piping below grade shall be Holiday tested prior to backfilling.

3.10 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify hot and cold water systems are complete, flushed and clean.
- B. Ensure PH of water to be treated is between 7.4 and 7.6.
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 ppm residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 ppm, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water.
- H. Submit sample of water from all new or modified systems to local Health Department and receive certification that water is acceptable for human consumption. Include certification of water in close out documents.

3.11 SCHEDULES

- A. Pipe Hanger Spacing:
 1. Metal Piping:
 - a. Pipe size: ½ to 1-1/4 inches:
 - 1) Maximum hanger spacing: 6.5 ft.
 - 2) Hanger rod diameter: 3/8 inch.
 - b. Pipe size: 1-½ to 2 inches:
 - 1) Maximum hanger spacing: 10 ft.
 - 2) Hanger rod diameter: 3/8 inch.
 - c. Pipe size: 2-½ to 3 inches:
 - 1) Maximum hanger spacing: 10 ft.
 - 2) Hanger rod diameter: 1/2 inch.
 - d. Pipe size: 4 to 6 inches:
 - 1) Maximum hanger spacing: 10 ft.
 - 2) Hanger rod diameter: 5/8 inch.

- e. Pipe size: 8 to 12 inches:
 - 1) Maximum hanger spacing: 14 ft.
 - 2) Hanger rod diameter: 7/8 inch.
 - f. Pipe size: 14 inches and over:
 - 1) Maximum hanger spacing: 20 ft.
 - 2) Hanger rod diameter: 1 inch.
2. Plastic Non-Metallic Piping:
- a. All Sizes:
 - 1) Maximum hanger spacing: 4 ft.
 - 2) Hanger rod diameter: 3/8 inch.

END OF SECTION 15410

SECTION 15440 - PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Plumbing fixtures.
- B. Plumbing miscellaneous equipment.

1.02 RELATED SECTIONS

- A. Section 15401 – Basic Plumbing Requirements.
- B. Section 15403 – Basic Plumbing Materials and Methods.
- C. Section 15405 – Plumbing Identification.
- D. Section 15407 – Plumbing Systems Insulation.
- E. Section 15410 – Plumbing Piping.

1.03 SUBMITTALS FOR REVIEW

- A. See Section 15401, Submittal for Review.
- B. Plumbing Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, trim and finishes.

1.04 SUBMITTALS AT PROJECT CLOSEOUT

- A. Refer to Division 1 and Section 15401 – Submittals for Project Closeout.
- B. Maintenance Data: Provide 3 sets of manufacturer's maintenance and parts listing including the manufacturers nearest sales and service representative. Include the sales representative's address and telephone number. Provide with the listing, a suggested maintenance schedule for all equipment along with warranty dates. Items are to be provided in three ring binders with tabs identifying different equipment types.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE AND PROTECTION

- A. Accept fixtures on site in factory packaging, inspect for damage and store.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.08 WARRANTY

- A. See other sections of the specification for additional warranty information.
- B. The Contractor shall warrant all materials, workmanship and equipment for a period of one year from the date of substantial completion. Any defect in equipment or workmanship shall be made known to the Contractor within 1 year. Such deficiencies shall be corrected by the Contractor at no cost to the Owner.

1.09 EXTRA MATERIALS

- A. See other sections of the specification for additional extra material requirements.
- B. Provide two sets of washers for all faucet types, two flush valve repair kits for all flush valve type and one loose key for each hose bibb or wall hydrant.

PART 2 - PRODUCTS

2.01 CLEANOUTS

- A. Furnish and install cleanouts where indicated on drawings and at all 90-degree bends, angle, upper terminals and not over 75 feet apart on straight runs. All cleanouts on cast iron piping to have bronze countersunk tapered slotted plugs, except PVC and acid waste piping cleanouts, which shall be standard of piping system used. Flush-with-floor cleanout access covers shall have non-skid covers. All wall cleanout access covers shall have polished satin finish. All cleanouts shall be full size of pipe, piping larger than 6" shall have minimum 6" cleanout covers.
- B. Exposed Cleanouts: Cast brass plug type, J.R. Smith #4470.
- C. Wall type cleanout plug and access covers, J.R. Smith #4472. Cleanout plug must be within 1" of finish wall and must be tapped for access cover. On PVC plastic and waste pipe in wall; cleanout access cover J.R. Smith 4710.
- D. Install wall cleanouts on stacks at flush valve fixtures 12" above top of flush valve, 12" above top of flush tanks, 12" above finish floor on sinks, lavatories and water coolers and 12" above grab bars at fixtures with grab bars. Locate cleanouts to clear baseboard at floor.
- E. Floor type cleanout access covers: J.R. Smith #4248-NB. Plug must be within 3" of finished floor. Provide J.R. Smith #4188 where installed in terrazzo floors and J.R. Smith #4168 where located in floor with asphalt or vinyl tile covering. Grout cleanout below access cover to seal watertight. Provide option "Y" cleanout carpet markers where installed in carpeted floors.
- F. Floor type cleanout covers for acid waste piping: J.R. Smith #4940.

- G. Outside Cleanouts: J.R. Smith #4258 cleanout access encased in a 18" X 18" X 6" deep concrete pad. See Detail on Drawings.

2.02 PLUMBING FIXTURES AND EQUIPMENT

- A. Water Heaters with side feed connections shall be installed with a vacuum relief valve equal to a Watts No. 36A installed in the cold water line. The relief valve shall be located down stream of the cold water cut-off valve and minimum 6" above the top of the heater.
- B. All "wetted" domestic potable fixtures, piping materials, valves shall meet the Federal Lead Free Guidelines. All materials shall be clearly marked and submitted with complete data during submittal review.
- C. Unless otherwise specified, all fixtures complete as catalogued, commercial grade, white color, exposed metal trim chromium plated.
- D. Fixtures and brass shall be securely anchored. Carriers shall be securely anchored to floor with lug bolts in all holes as recommended by the manufacturer.
- E. Flush valve "YJ" supports shall be installed 1 inch below vacuum breaker on all water closet flush valves and around vacuum breaker on urinal flush valves. Handles on A.D.A. water closets to be installed on wide side of room or stall.
- F. Seal wall hung fixtures at wall with white silicone sealant. Seal countertop fixtures with clear silicone sealant.
- G. Mount all fixtures at standard mounting height unless otherwise noted.
- H. All faucets to be furnished with ceramic discs.
- I. Furnish sinks and lavatories with correct number of drillings required for the faucet and accessories. Hole covers are not acceptable.
- J. All similar products shall be by the same manufacturer.
- K. All fixtures noted to be A.D.A. approved must be set with great care to assure proper mounting height and proper distance from wall.
- L. Provide Symmons "Maxline" LF5-210-CK thermostatic mixing valve or approved equal under all public and A.D.A. lavatories. Set hot water temperature at 109 deg F.
- M. All items complete as catalogued as follows: Reference schedule sheets

2.03 FOOD SERVICE EQUIPMENT

- A. All equipment is furnished and set in place under the Food Service Section.
- B. All sink waste outlets, strainers, lever wastes and tailpieces are furnished under Food Service Section.
- C. All faucets are furnished under the Food Service Section.

- D. Under this Section rough and connect in accordance with shop drawings accompanying the equipment.
- E. Under this Section extend all wastes to floor sinks, using D.W.V. copper and securely anchored in the horizontal. Install flow control devices on sink wastes as shown and detailed on drawings.
- F. Receive faucets, furnished under the Food Service Section set, rough, connect and furnish McGuire #165 supplies with stops.
- G. Furnish faucets as specified for each individual piece of equipment.
- H. Furnish McGuire #8912 P-Traps where sink, etc., is not piped to a floor sink.

2.04 ACCEPTABLE MANUFACTURERS

- A. Where Kohler is listed above, Zurn or American Standard may be substituted.
- B. Where Sloan is listed above, Zurn may be substituted.
- C. Where J. R. Smith is listed above, Josam, Zurn, Mifab, Watts, or Wade may be substituted.
- D. Where Elkay water coolers are mentioned above, Oasis, or Acorn may be substituted, only if water ways are constructed of totally lead free materials.
- E. Where Armstrong is listed above, the equal of B & G, Taco, Grundfos or Thrush may be substituted.
- F. Where Church is listed above, Bemis, Beneke, Centoco, Olsonite or Comfort Seats may be substituted.
- G. Where Stern Williams is listed above, Acorn or Fiat may be substituted.
- H. Where EBC is listed above for traps, outlets and stops, McGuire, Kohler, Crane, Eljer or American Standard may be substituted.
- I. Where Chicago is listed above for shower valves, Leonard, Powers or Lawler may be substituted.
- J. Where EBC-IK is listed above, Pro-wrap by McGuire, "Handi Lav-Guard" by Truebro, "Trap-Wrap" by Brocar Industries, Inc. or Plumberex may be substituted.
- K. Where Amtrol is listed for expansion tanks, Watts or Armstrong may be substituted.
- L. Where Navien is listed, Rinnai or Noritz may be substituted.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Verify all electrical characteristics of electrical motors, starters and equipment with Electrical Drawings. Should the Contractor change the characteristics of the electrical

equipment, it shall be the responsibility of the Contractor to coordinate all changes with the other trades and bear all costs of such changes.

- B. Coordinate all cutouts in millwork and casework with supplier for proper cutout dimensions.
- C. Install all fixtures and equipment in accordance with manufacturer's recommendations.
- D. All wall hung fixtures are to be installed on floor mounted fixture supports. Fixture supports are to be anchored to floor with anchors in all mounting holes. Anchors to be sized as per the manufacturers recommendations. Seal all fixtures to walls and floor with white silicone sealant. Seal all sinks to counter tops with clear silicone sealant.
- E. Adjust all stops, flush valves and valves for intended water flow rate.
- F. Clean plumbing fixtures and equipment and remove tags.
- G. Install all electric water heaters with clearance for removal of heating elements.
- H. Provide backing in wall for flush valve YJ brackets, faucet supports, etc. Anchor to the backing with anchoring screws of sufficient length to penetrate backing. See Section 15410, Part 3.
- I. Provide stops with chrome-plated nipples penetrating wall and cover penetrations with chrome-plated escutcheons. Note: Compression type stops and plastic stems are not acceptable.

END OF SECTION 15440

SECTION 15451 - GENERAL FIRE PROTECTION REQUIREMENTS

PART ONE - GENERAL:

1.1 RELATED DOCUMENTS

- A. Division 1 – Section “ALTERNATES”: Coordinate related Division 15 work and modify surrounding work to integrate the Work of each Alternate.

1.2 SUMMARY

- A. Description of General Fire Protection Requirements. Applies to all Division 15, Section 15450's (Fire Protection).

1.3 DEFINITIONS

- A. "Provide" means to furnish and install, complete and ready for operation.

1.4 REFERENCES

- A. ASME: American Society for Mechanical Engineers.
- B. ASTM: American Society of Testing and Materials.
- C. AWWA: American Water Work Association.
- D. FM: Factory Mutual.
- E. NEMA: National Electrical Manufacturer's Association.
- F. NFPA: National Fire Protection Association.
- G. MSS: Manufacturer's Standardization Society of the Valve and Fitting Industry.
- H. UL: Underwriters Laboratories, Inc.

1.5 REGULATORY REQUIREMENTS

- A. Comply with current edition, unless otherwise noted, of the following codes and standards.
 - 1. ANSI B31.9 - Building Services Piping.
 - 2. ADA - American's with Disabilities Act.
 - 3. NFPA 13 – Installation of Sprinkler System.
 - 4. NFPA 30 – Flammable and Combustible Liquids Code.
 - 5. NFPA 31 – Installation of Oil-Burning Equipment.
 - 6. NFPA 54 – National Fuel Gas Code.
 - 7. NFPA 70 - National Electrical Code.
 - 8. NFPA 101 - Life Safety Code.
 - 9. IBC - International Building Code with Fire, Mechanical, Plumbing and Gas Codes; 2009 Edition.
- B. Permits, Licenses, Inspections and Fees.
 - 1. Obtain and pay for all permits, licenses, inspections and fees, and comply with

- all rules, laws and ordinances pertaining to the Contractor's portion of the Work.
2. Obtain and pay for certificates of required inspections, and file certificates with Owner.

1.6 PRODUCT REQUIREMENTS

- A. Provide new standard, materials throughout.
- B. Multiple items of similar equipment shall be the product of the same manufacturer.
- C. Substitutions:
 1. Comply with the provisions of Division 1, Section "Product Requirements" and the following:
 2. When several manufacturers are named in the specifications, the corresponding products and models made by the specified manufacturers will be accepted and Contractor may base his bid on any one of those products. However, if the Contractor's bid is based on products other than the scheduled or specified **basis of design**, it shall be understood that there will be no extra cost involved whatsoever, and the effect on other trades has been included in the Contractor's proposal. Coordination with other trades for substituted equipment or use of products other than the named basis of design shall be the responsibility of the Contractor furnishing the equipment.
 3. The basis of design manufacturer's equipment has been used to determine space requirements. Should another approved manufacturer's equipment be used in preparing proposals, Contractor shall be responsible for determining that said equipment will fit space allocated. Submission of shop drawings or product data on such equipment shall be considered as indicating that the Contractor has reviewed the space requirements and the submitted equipment will fit the space allocated with due consideration given to access required for maintenance and code purposes.
 4. The basis of design manufacturer's equipment and scheduled Fire Protection equipment electrical requirements have been used to coordinate the electrical requirements of the plumbing equipment with the electrical systems serving that equipment.
 - a. Contractor shall coordinate the electrical requirements of the equipment actually furnished on this project and provide the electrical systems required by that equipment at no additional cost to the Owner.
 - b. Equipment of higher or lower electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified at no additional cost to the Owner.
 - c. Prior to approval of submittals of Fire Protection equipment with electrical requirements that are greater or lower than those shown on the Drawings, Contractor shall submit letter verifying that required changes to the electrical system, serving the specific piece of equipment in question, have been coordinated with the electrical contractor. Letter to be included with the associated equipment submittal, addressed to the Architect with a copy to the electrical engineer.
 5. Each bidder may submit to the Architect a list of any substitutes which he proposes to use in lieu of the equipment or material named in the specifications with a request for the approval of proposed substitutes. To be

considered, such requests must be delivered to the office of the Architect not later than 10 days prior to bid due date. The submittal shall include the following:

- a. Specific equipment or material proposed for substitution giving manufacturer, catalog and model number.
 - b. All performance and dimensional data necessary for comparison of the proposed substitute with the equipment or material specified.
 - c. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require.
6. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.

1.7 SUBMITTALS

- A. Submit under provisions of Division 1, Section "Submittal Procedures" and the following:
- B. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment which are to be provided under the 15450 Sections of Division 15.
 1. List shall be complete with manufacturer's names, catalog number, dimensions, specifications, rating data and options utilized. Capacities shall be in the terms specified.
 2. Call attention to deviations from specified items as to operation and physical dimensions.
 3. Performance curves for pumps shall be included.
 4. Final equipment orders shall not be placed until submittals have been returned marked "No Exceptions Noted" or "Make Corrections Noted".
 5. Bind all equipment submittals and provide index tab for each type of equipment. Submit all at one time. Reserve two sets for project close-out documents.
- C. Shop Drawings: Before starting work, submit and obtain approval from Architect of detailed drawings of the following, fully dimensioned and drawn to 1/8" to 1'-0" scale. Submit six (6) prints of each drawing. Engineer will return five (5) of the prints with comments noted. Failure to submit shop drawings will make the Contractor responsible for changes required to facilitate installation.
 1. Fire Protection Systems. See Division 15, Section "Fire Protection System."
 2. For multi-story buildings, submit detailed floor penetration sleeve layout drawings. See Division 15, Section "Plumbing Basic Materials and Methods," Article "Informational Submittals."

1.8 COORDINATION DRAWINGS

- A. General:
 1. Within 60 days of Notice to Proceed provide Coordination Drawings for the following the building:
 2. Do not base Coordination Drawings on reproduction of Contract Documents or standard printed data.
 3. Submitted Coordination Drawings are for information only and typically will not be returned to the Contractor. Architect will not take any action, but may

define coordination conflicts or problems and inform the Contractor of such conflicts or problems.

- B. Content:
1. Project specific information, drawn accurately to scale.
 2. Show sequencing and spatial relationship of separate units of work that must function in a restricted manner to fit in the space provided, or function as indicated.
 3. Indicate dimensions shown on Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- C. Format:
1. Coordination shop drawings shall be drawn to a scale of not smaller than $\frac{1}{4}" = 1'-0"$.
 2. Provide drawings on electronic media in AutoCad .dwg format.
 3. Provide layering system separate from wall outline and unique to each discipline.
 4. In addition to plan view, provide sections as required to clarify congested situations and verify vertical clearances.
 5. Base drawings and building sections in .dwg format will be provided by Architect.
- D. Fire Protection Shop Drawings: Fire Protection subcontractor shall add all fire protection equipment, piping, sprinkler heads and other elements to database.
1. Upon completion of Fire Protection shop drawings, transmit electronic database to Electrical subcontractor.
- E. General Contractor's Final Coordination: General Contractor shall thoroughly review shop drawings, adding additional building elements where appropriate, and shall resolve conflicts, coordinating with the Architect, and the various subcontractors.
- F. Submit Coordination Shop Drawings: Upon completion of final coordination, General Contractor shall approve coordination shop drawings and transmit 3 sets of hard copies and electronic files on CD's to Architect.

1.9 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm experienced in installation of systems similar in size and complexity to those required for this project, plus the following:
1. Acceptable to, or licensed by, manufacturer.
 2. Not less than 3 years experience with systems.
 3. Successfully completed not less than 5 comparable scale projects using systems similar to those for this project.
 4. Professional Engineer licensed in the State in which the work occurs; or NICET Level 3 and licensed by the State Fire Marshall in the State in which the work occurs. NICET Level 3 Contractor to supervise / inspect installation.

1.10 SUMMARY OF WORK

- A. Scope: Provide all labor, materials, equipment and services necessary for the completion of all fire protection work shown or specified, except work specified to be done or furnished by others, complete and ready for operation.

1.11 DRAWING INTERPRETATION AND COORDINATION

- A. Drawings are intended to show size, capacity, approximate location, direction and general relationship of one phase to another, but not exact detail or arrangement.
- B. Do not scale drawings for location of system components. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings and conditions existing in the field and lay out work so as to fit in with ceiling grids, lighting and other parts.
- C. Make minor adjustments in the field as required to provide the optimum result to facilitate ease of service, efficient operation and best appearance.
- D. Where doubt arises as to the meaning of the Drawings and Specifications, obtain the Architect's written decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.
- E. Refer to Architectural Drawings for all dimensions and location of lights, ceiling diffusers and sprinkler heads.

1.12 PROJECT/SITE CONDITIONS

- A. Visiting Site: Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.
- B. Determine sizes and locations, and inverts of existing and new utilities near site.
- C. Cause as little interference or interruption of existing utilities and services as possible. Schedule work which will cause interference or interruption in advance with Owner, authorities having jurisdiction, and all affected trades.

1.13 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit under provisions of Division 1 Sections - "Closeout Procedures" and "Project Record Documents" and the following.
- B. Record Drawings:
 - 1. Keep accurate record of corrections, variations, and deviations, including those required by change orders to the Fire Protection drawings.
 - 2. Accurately show location, size and elevation of new exterior work dimensioned from permanent structure.
 - 3. Record changes daily on a set of prints kept at the job site.
 - 4. Submit prints marked as noted above to Architect for review prior to request for final payment.
 - 5. Marked prints will be returned to Contractor for use in preparing Record Drawings.
 - 6. Engineer will use marked up drawing showing as-built conditions provided by Contractor to prepare Record Drawings.
- C. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
 - 1. Record drawings – fire protection piping (pdf / dwg / reproducibles) and electronic files in

- AutoCAD.
- 2. Equipment Submittal Data (2).
- 3. Equipment operating and maintenance manuals (2).
- 4. Equipment warranty dates and guarantees (2).
- 5. List of Owner's Personnel who have received operating and maintenance instructions.
- 6. Install valve charts and valve location plans in main mechanical room. (See Division 15, Section "Plumbing Identification.")
- 7. Submit start-up/field inspection reports for:
 - a. Fire system
- D. Contractor's Material and Test Certificate for above ground piping.
- E. Contractor's Material and Test Certificate for underground piping.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 15451

SECTION 15453 - BASIC FIRE PROTECTION MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

- A. Description of common piping, equipment, materials and installation for Fire Protection systems.
- B. This Section includes the following:
 - 1. Piping materials and installation instructions common to most Fire Protection piping systems.
 - 2. Sleeves.
 - 3. Concrete.
 - 4. Grout.
 - 5. Escutcheons.
 - 6. Access doors - Building.
 - 7. Flashing
 - 8. Workmanship.
 - 9. Cutting and patching.
 - 10. Excavation, trenching and backfilling.
 - 11. Connection to existing systems.
 - 12. Piping systems installation - Common Requirements.
 - 13. Equipment installation - Common Requirements.
 - 14. Painting and finishing.
 - 15. Concrete bases.
 - 16. Supports and anchorages.
 - 17. Protection and cleaning of equipment and materials.

1.02 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. 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.

1.03 SUBMITTALS

- A. Product Data: For the following:
 - 1. Transition fittings.
 - 2. Dielectric fittings.
 - 3. Mechanical sleeve seals.

4. Escutcheons.
5. Access doors - building.

1.04 INFORMATIONAL SUBMITTALS

- A. Shop Drawings: For multi-story buildings, submit detailed drawings of the floor penetration sleeve sizes and locations, including the following information:
 1. Fully dimensioned off column lines with location relative to adjacent walls shown.
 2. Sleeve size.
 3. Pipe size.
 4. Pipe service.

1.05 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 to prevent entrance of dirt, debris, and moisture. If pipes do not ship with end caps, cover ends of pipe stored on site with 6 mil plastic.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.06 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for Plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves and inserts in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate installation of building access doors for fire protection items requiring access that are concealed behind finished surfaces.
- D. Electrical Characteristics for Fire Protection Equipment:
 1. Coordinate electrical system installation to match requirements of equipment actually furnished on this project.
 2. Include a letter with the respective equipment submittal from the electrical contractor and approved by electrical design consultant, detailing changes to the electrical system required to accommodate changes in the power distribution system to accommodate Fire Protection equipment that has different electrical power requirements from that equipment used as basis of design, or power provisions, as shown on the electrical drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

1. Manufacturers: Subject to compliance with requirements. Provide products by one of the following:

2.02 PIPE, TUBE AND FITTINGS

- A. Refer to individual Division 15 Fire Protection Piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.03 JOINING MATERIALS

- A. Refer to individual Division 15 Fire Protection Piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless 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. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.

2.05 SLEEVES

- A. Galvanized-Steel Sheet: 20 gauge minimum thickness; round tube closed with longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Firestopping Sealant: See Division 7 Sections "Through-Penetration Firestop Systems" and "Fire Resistive Joint Systems" for firestopping sealant requirements.
- D. Stuffing Insulation: Glass fiber type, non-combustible.

2.06 CONCRETE

- A. Nominal weight concrete (145 PCF) using Type I Portland Cement, 1-inch maximum size coarse aggregate to provide a minimum 28 day compressive strength of 3000 psi.

2.07 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

2.08 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
 - 1. Finish: Polished chrome-plated.

2.09 ACCESS DOORS – BUILDING

- A. Manufacturers:
 - 1. Bilco.
 - 2. Milcor.
 - 3. Nystrom.
- B. Construction:
 - 1. Door: 14-gauge, cold rolled steel.
 - 2. Frame: 16-gauge, cold rolled steel of configuration to suit material application.
 - 3. Hinge: Concealed spring hinge.
 - 4. Latch: Screwdriver cam latch.
 - 5. Finish: Phosphate dipped and prime coated.
 - 6. UL labeled when in fire-rated construction with rating to match construction.
 - 7. Stainless steel (Type 304) shall be used in ceramic tile or glazed structural tile.
- C. Size: 16 inch x 16 inch minimum, as indicated on drawings, or as required to allow inspection, service, and removal of concealed items.

2.10 FLASHING

- A. Flexible Flashing: 47 mil thick sheet butyl compatible with roofing.
- B. Lead Flashing: Waterproofing, 5 lb/SF sheet lead.
- C. Pitch Cups: 20 gauge galvanized steel, minimum 8 inches deep, bases mitered and soldered and extending at least 4 inches horizontally.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. First class and in accordance with best practice. Work to be orderly, neat in appearance and performed by skilled craftsman.
- B. Poor or improper workmanship shall be removed and replaced as directed by the Architect without additional cost to the Owner or design professionals.

3.02 CUTTING AND PATCHING

- A. Comply with the requirements of other Divisions for the cutting and patching required to accommodate the installation of Fire Protection work. Repair and finish to match surrounding.
- B. Architect's approval required before cutting any part where strength, or appearance of finished work is involved.
- C. Openings are to be laid out and built-in, set sleeves and inserts and furnish detailed layout drawings to other trades in advance of their work.
- D. Core drill or saw cut openings in existing masonry construction.

3.03 EXCAVATION, TRENCHING AND BACKFILLING

- A. Provide trenching, excavation, backfilling necessary for performance of work, including excavation of rock and all other materials which may be encountered.
- B. Grade bottom of trenches evenly and excavate bell holes to insure uniform bearing for the full pipe length. Excavate minimum 6 inches below pipe. Refill cuts below grade with sand.
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel in accordance with requirements in Division 2. Section "Earthwork" no less than 95% compactancy. Backfill paved areas with sand or fine gravel compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe.
- D. Refer to Division 15, Fire Protection Piping Sections for specific bedding and backfill requirements.
- E. Restore existing pavement, curbs, sidewalks, sodding, bushes, etc., matching surroundings.
- F. Restore all pavement cuts to meet the requirements of the cuts of the local authority.

3.04 PIPING SYSTEMS INSTALLATION - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 15 Fire Protection Piping Sections specifying piping systems.

- B. Drawings, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas and stairwells.
- D. Install piping indicated to be exposed and in service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections. No mitering or notching for fittings permitted.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install escutcheons where exposed piping penetrates walls, ceilings, and floors in finished spaces.

3.06 SLEEVES

- A. Sleeves are not required for core-drilled holes.
 - 1. In mechanical room floors and other potentially wet areas, provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
- B. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length so that sleeve extends out ½ inch from both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas, or other potentially wet areas, 1-1/2 inches above finished floor level. Caulk space outside of sleeves water tight.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3. Use the following sleeve materials:
 - a. Sleeves for Piping Through Concrete Beams, Concrete Walls, Footings, and Potentially Wet Floors: Steel pipe.
 - b. Sleeves for Piping Through Masonry Walls and Gypsum Board Partitions: Steel sheet sleeves 1/2 inch larger than pipe or pipe covering.

4. Where piping penetrates non-rated equipment room wall, floors or roofs outside of a shaft, close off space between pipe or duct and adjacent work with stuffing insulation and caulk air tight.
 5. Above ground, non-rated, exterior wall penetrations: Seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
 6. Provide for continuous insulation wrapping thru sleeve.
 7. Seal space around the outside of sleeves with grout at masonry walls and floors and dry wall mud at gypsum board partitions.
- C. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- D. Fire-Rated Penetrations: Where pipes pass through fire-rated and fire-resistive floors, walls, and partitions, install appropriately rated sleeves and firestopping sealant. Firestopping materials and installation methods are specified in Division 7 Sections "Through Penetration Firestop Systems" and "Fire Resistive Joint Systems".

3.07 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 15 Fire Protection Piping Sections specifying piping systems.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe 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 unless dry seal threading is specified.
- D. Flanged Joints:
1. 125 Pound Cast Iron Flange (Plain Face): Mating flange shall have raised face, if any, removed to avoid overstressing the cast iron flange.
 2. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.08 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.09 PIPE CLEANING

- A. Keep pipe clean and free of dirt. Keep caps on ends of pipe when it is stored on site and reinstall caps on ends of installed piping at the end of each day.

3.10 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.
- D. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with Contract Documents, obtain Architect's decision before proceeding.
- E. Install equipment to allow right of way for piping installed at a required slope.
- F. All equipment shall be firmly fastened in place:
 - 1. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
 - 2. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.

3.10 PAINTING AND FINISHING

- A. Except as specified below or noted on the Drawing, requirements for painting of Fire Protection systems, equipment, and components are specified in Division 9 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
- C. Painting of fire piping:

1. The following piping within boiler and chiller room shall be painted in its entirety under Division 9: Painting. Color codes are listed here for information only.

- a. Fire Protection Piping: Red Metaltex B47R3.

2. Should there be a conflict of colors in existing installations, contact the Architect.

3.11 CONCRETE BASES

- A. Provide concrete foundations with nominal dimensions conforming to the following schedule for floor-mounted equipment:

<u>Equipment</u>	<u>Foundation</u>
Equipment and piping stands and supports	4" high pad
Equipment located in equipment rooms, not listed above	4" high pad or as indicated on the Drawings

- B. Concrete bases shall be continuous and shall have beveled edges and smooth float finish. Concrete bases shall be reinforced with No. 3 bars a maximum of 12" on center each way, and held in place with dowel rods at each corner anchored in the slab. Dowel rods shall not penetrate through the slab.
- C. Roughen and clean exposed slabs before pouring foundations. Apply bonding agent to surfaces in contact.
- D. Concrete pads shall extend a minimum of 4" beyond the equipment footprint in all directions, including appurtenances, vibration isolators, base elbow supports, and motors.
- E. Equipment attached directly to foundations or inertia bases; bases provided with grout holes; and bases consisting of a structural frame shall have voids filled with grout after attachment to foundation.
- F. Fill voids between baseplates and foundations, and level equipment, with grout.

3.12 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" requirements.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing and fire protection materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.13 GROUTING

- A. Mix and install grout for Fire Protection equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.

- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

3.14 ACCESS DOORS – BUILDING

- A. Provide access doors in wall and inaccessible ceilings to allow access to service and maintain concealed Plumbing equipment, valves, etc.
- B. Coordinate installation of access doors with Divisions responsible for Building System in which panels are being installed.

3.15 FLASHING

- A. Provide flexible flashing and metal counterflashing where pitch cups and piping penetrate weather or waterproofed walls, floors and roofs.

3.16 PROTECTION AND CLEANING OF EQUIPMENT, FIXTURES, AND MATERIALS

- A. Equipment and materials shall be carefully handled, properly stored, and protected from weather, dust-producing procedures, or damage during construction.
- B. At completion of all work, thoroughly clean exposed materials (pipe, etc.) and equipment and make ready for painting.

END SECTION 15453

SECTION 15455 - FIRE PROTECTION SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pipe, Fittings, Valves for:
 - 1. Service from the water main to the building.
 - 2. Wet sprinkler system.

- B. System design and installation. Base system design hydraulic calculations using the area/density method on the following criteria and in accordance with NFPA 13 latest edition.
 - 1. Sprinkler Protection:
 - a. All sleeping, office, waiting areas, educational areas, dining areas, corridors and attics: Light hazard, 0.10 gpm/sq. ft. over the hydraulically most remote 1500 sq. ft.
 - b. Kitchen, Mechanical Equipment Rooms, Transformer Rooms, Electrical Switchgear Rooms, Electric Closets, Elevator Shafts (if required), Elevator Machine Rooms, Refrigeration Service Rooms, and storage between 100 and 250 sq. ft.: Ordinary Hazard, Group 1, 0.15 gpm/sq. ft. over the hydraulically most remote 1500 sq. ft.
 - c. Storage rooms, storage rooms over 250 sq. ft., boiler plants, loading docks, and energy centers: Ordinary Group 2, 0.20 gpm/sq. ft. over the hydraulically most remote 1500 sq. ft.
 - d. Supply Areas with storage limit less than 12 ft. high: Ordinary Hazard Group 2. Storage height exceeding 12 ft., per NFPA 13 latest edition.
 - e. Provide sprinklers in accessible shafts per NFPA 13 latest edition.
 - 2. Add water allowance of 250 gpm for inside and outside hose streams to the sprinkler requirements at the connection to the distribution main.
 - 3. Hydraulic Calculations: The calculated demand including hose stream requirements shall fall no less than 10 percent below the available supply curve.
 - 4. Comply with IBC, NFPA 13, NFPA 30, Flammable and Combustible Liquid Code, NFPA 45, Standard on Fire Protection for Laboratory Using Chemicals, NFPA 54, National Fuel Gas Code, NFPA 58, Liquefied Petroleum Gas Code, NFPA 70, National Electric Code, NFPA 72, National Alarm and Signaling Code, and NFPA 101, Life Safety Code.

1.1 RELATED SECTIONS

- A. Section 15405 – Plumbing Identification.
- B. Section 15451 – General Fire Protection Requirements.
- C. Section 15453 – Basic Fire Protection Materials and Methods.

1.2 SYSTEM

- A. A wet sprinkler system providing coverage for the entire building courthouse and partial building fire station.
- B. Fire service from approximately 5ft outside the building to inside the building.

1.3 SUBMITTALS FOR REVIEW

- A. Submit under provisions of Division 1, Section “Submittal Procedures” and the following:
- B. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment which are to be furnished under Division 15.
 - 1. List shall be complete with manufacturer’s names, catalog number, dimensions, specifications, rating data and options utilized. Capacities shall be in the terms specified.
 - 2. Call attention to deviations from specified items as to operation and physical dimensions.
 - 3. Performance curves for equipment such as pumps shall be included.
 - 4. Final equipment orders shall not be placed until submittals have been returned marked “No Exceptions Noted” or “Make Corrections Noted”.
 - 5. Bind all equipment submittals and provide index tab for each type of equipment. Submit all at one time. Reserve two sets for project close-out documents.
- C. Shop Drawings: (Wet Sprinkler)
 - 1. A reflected ceiling plan indicating locations of sprinkler heads, lights, HVAC devices, smoke detectors, exit lights and any additional items attached to ceiling. In lift out ceilings, sprinkler heads are to be centered in ceiling tiles. In hard ceilings, sprinkler heads to follow the general arrangement of the ceiling. After review by the Architect, revise layout as required.
 - 2. Prepare a working pipe shop drawing based on hydraulic calculations. The piping shop drawing shall indicate routing and configuration of piping, size of pipe, piping support, elevation of piping and coordination of piping with ductwork. Shop drawings shall include low point drain downs.

3. Hydraulic calculations are to be prepared utilizing a current water flow test (maximum 90 days old). If current flow test is not available, obtain a current flow test and pay for all fees required.
4. If water flow information is not available due to new main extension or other construction which prohibits the availability of flow information at the start of construction, the contractor shall estimate probable flow information based on information available. Once permanent water is available at the site, the Contractor shall perform a flow test, incorporate the information into the calculation and make any modifications to the system as may be required.
5. When drawings and hydraulic calculations are submitted to the Engineer for review, they shall bear the seals of Nicet Level 3 Designer, review and approval of the Architect, General Contractor and the Owners Insurance Underwriter. Note: Nicet designer shall be an employee of the Fire Protection Contractor.
6. The Contractor shall incorporate all comments for approval by local Fire Marshall's Office and any State of Alabama Reviewing Agency. Contractor shall provide signed, sealed and approved set of plans to Engineer upon approval by state and local authorities.

1.4 SYSTEM INSTALLATION AND INSPECTION

- A. Required Inspections:
 1. All underground and above ground fire line piping must be inspected by a Fire Inspector prior to being covered or concealed.
- B. Fire Stopping:
 1. All fire stopping of any and all fire rated assemblies must be inspected and approved by a Fire Inspector prior to the work being concealed.
- C. Hydrostatic Testing Requirements:
 1. The required hydrostatic testing of the underground and above ground fire line piping must be witnessed and approved by an Fire Inspector prior to being covered or concealed.
- D. Underground Fire Line Pipe Flush Test Requirements:
 1. The required flush test of the underground fire line piping must be witnessed by an Fire Inspector prior to being connected to the above ground piping or riser.
- E. Acceptance Inspections & Testing:
 1. Allow fire protection and life safety systems installation and acceptance test must be inspected, test, witnessed and approved by an Fire Inspector before the system can be accepted by the University.
- F. Plans Review & Approval:

1. All fire protection and life safety system drawings and specifications must be reviewed by this office to ensure code compliance prior to start of any work.

G. RMS Inspection Schedule Notification:

1. Provide a minimum one week notice of all inspections.

1.5 REGULATORY REQUIREMENTS

- A. Materials: Conform to UL and FM Global Requirements and Standards.
- B. Sprinkler System: Conform to NFPA 13, State of Alabama Fire Marshall Requirements and, City of Glencoe Fire and Rescue Requirements.
- C. Private Service Mains: Conform to NFPA 24.
- D. NFPA 25, Inspections, Testing and Maintenance of Water-Based Fire Protection Systems.
- E. NFPA 72, Standard for the Installation, Maintenance and Use of Protective Signaling Systems.
- F. NFPA 72E, Standard on Automatic Fire Detectors.
- G. NFPA 75, Standards for the Protection of Technology Equipment.
- H. Applicable Building Codes.
- I. Welding Materials and Procedures: Conform to ASME Code.
- J. Valves: Bear UL, FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- K. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.6 EXTRA MATERIALS

- A. Provide extra sprinklers under provisions of NFPA 13, State and Local requirements.
- B. Provide suitable wrenches for each sprinkler type.
- C. Provide metal storage cabinet in location designated. (Designate location).

PART 2 - PRODUCTS

2.1 PIPING BELOW GRADE AND BELOW SLAB ON GRADE

- A. Ductile Iron: Cement lined ANSI A-21.50.
- B. Joints on Ductile Iron: Standard mechanical joint ANSI A-21.11. Provide with retainer glands at all fittings and thrust blocks minimum 1 cubic yard of concrete at all changes of direction.

2.3 WET SPRINKLER SYSTEM

A. Wet System - Above Ground Piping:

1. Black Steel Pipe:

- a. All piping 1-1/2" and smaller, all piping larger than 1-1/2" with cut grooves on threaded and all welded piping, Schedule 40 black steel ASTM A53, ASTM A795, ASTM A135.
- b. Piping larger than 1-1/2" for roll grooving only, Schedule 10 ASTM A795, ASTM B36.10. Schedule 10 pipe may not be used for threading or cut grooving.
- c. Cast iron threaded fittings ANSI B16.4 cast iron flanges and flanged fittings ANSI B16.1.
- d. Malleable iron threaded fittings, ANSI B16.3.
- e. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts and washers; galvanized for galvanized pipe.
- f. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement into pipe.
- g. Malleable Iron Fittings 175 lb. (250 lb.); ASME B16.3, threaded fittings.

2. Copper Tubing: ASTM B75; ASTM B88; Type K, hard drawn.

- a. Fittings: ASME B16.22, wrought copper and bronze, solder joint, pressure type.
- b. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.

2. Copper Tubing: ASTM B75; ASTM B88; Type K, hard drawn.

- a. Fittings: ASME B16.22, wrought copper and bronze, solder joint, pressure type.
- b. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.

3. All piping shall be pitched to drain down at low points. Low point shall be at sanitary drains at Mechanical Rooms only. Note: Unless approved by Owner / Engineer.

C. Sprinklers - Wet System:

1. Sprinklers to be UL approved glass bulb quick response type.
2. Suspended Ceiling (Layin and Gypsum):

- a. Manufactures:
 - 1) Viking Model M.
 - 2) Tyco, Reliable, Victaulic.
 - b. Type: Quick response concealed pendant type with painted cover plate.
 - c. Cover Plate: White. Unless indicated otherwise. Provide color chart to Architect for color selection.
 - d. Finish: Sprinkler Head – chrome plated.
 - e. Fusible Link: Glass bulb type temperature rated for specific area hazard.
4. Exposed Area Type:
- a. Manufactures:
 - 1) Viking Model M.
 - 2) Tyco, Reliable, Victaulic.
 - b. Type: Quick response upright type with guard.
 - c. Finish: Brass or chrome plated.
 - d. Fusible Link: Glass bulb type temperature rated for specific area hazard.
 - e. Guards: Finish to match sprinkler finish.
- D. Pipe Hangers and Supports:
- 1. Conform to NFPA 13.
 - 2. Hangers for Pipe Sizes ½ to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 - 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
 - 7. Vertical Support: Steel riser clamp.

8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Plate Support: Carbon steel ring, adjustable, copper plated.
10. All hangers to be a maximum of 12 inches from the end of a branch line or an arm-over for drop.

E. Gate Valves:

1. Up to and including 2 Inches:
 - a. Manufactures:
 - 1) Nibco Model T-104-O.
 - 2) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.
 - b. Bronze body, bronze trim 175 psi WP, UL Listed, rising stem, handwheel, solid wedge or disc, threaded ends.
2. Over 2 Inches:
 - a. Manufactures:
 - 1) Nibco Model F-607-OTS.
 - 2) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.
 - b. Iron body, bronze trim 175 psi WP, UL Listed, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid bronze or cast iron wedge, flanged or grooved ends.

F. Butterfly Valves:

1. Cast or Ductile Iron Body
 - a. Manufactures:
 - 1) Nibco Model GD-4765-4/8.
 - 2) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.
2. Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, lug, or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and internal tamper switch rated, UL / FM approved.

G. Check Valves:

1. Up to and including 2-1/2 inches to 6 inches:

a. Manufacturers:

1) Nibco Model G-917-W.

2) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.

b. Iron body and swing disc, bronze seat, stainless steel spring, grooved ends, 175 psi WP.

2.4 EQUIPMENT

A. Water Flow Switch:

1. System sensor pressure activated detector. Potter, Viking, and Tyco are acceptable manufacturers.

B. Pressure Switch:

1. System sensor WFD water flow detector. Potter, Viking, and Tyco are acceptable manufacturers.

C. Supervisory Switches:

System sensor OSY2 Model tamper detector. Potter, Viking, and Tyco are acceptable manufacturers.

D. Test and Drain Assembly:

1. Viking Model A-1 complete with sight glass and 1/2" orifice for test purpose. Pipe discharge to drain riser on to exterior and spill on splash block.

Tyco, Victaulic, and Reliable are acceptable manufacturers.

E. Fire Department Siamese Connection:

1. Crocker Figure No. 6410-PC chrome plated exposed with clappers, caps and chains.
2. Location to be coordinate with Fire Chief and Architect.

Elkhart, Croker and Guardian Fire are acceptable manufacturers

F. Double Check Assembly: Ames C300 OS & Y double detector check valve.

G. Alarm Check Valve:

Viking J-1 Easy Riser Alarm Check Valve with Vertical Trim. Install complete with Trim Kit. Valve to have 300psi working Pressure. Viking, and Tyco are acceptable manufacturers.

2.5 FIRE STOP SYSTEMS

A. All wall and floor penetrations are to be closed. Refer to the Arch. Life Safety Plans and close all openings with a U.L. listed assembly compatible with the rating of the wall or floor being penetrated.

- B. Non-rated walls – sheet rock joint compound may be used to seal opening.
- C. For piping passing through listed sheet rock walls or partitions:
 - 1. Uninsulated pipe passing through 2 hour walls or partitions – minimum 5/8" depth of Hilti FS 605 filling annular space between wall and pipe on both sides of wall. U.L. Listing #WL1056.
 - 2. Uninsulated pipe passing through 2 hour walls or partitions – minimum 1-1/4" depth of Hilti FS 601 filling annular space between pipe and wall on both sides of wall, U.L. Listing #WL1054.
- D. For piping passing through concrete floors, concrete walls or concrete block walls.
 - 1. Uninsulated Schedule 40 steel pipe; fill annular space between pipe and opening with Hilti #FS 605. U.L. Listing #CJ1184.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install piping in accordance with NFPA 13 for sprinkler systems, NFPA 24 for service mains.
- B. Connect to site fire service installed under another section. Verify the site with civil drawings for the exact size and location of the service prior to beginning work.
- C. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- D. Install piping to conserve building space, to not interfere with use of space and other work.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforcement concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- H. Pipe Hanger and Supports:

1. Install in accordance with NFPA 13 and NFPA 14.
 2. Hangers on branch lines to comply with NFPA 13, 9.2.3.
 3. Hangers on mains to comply with NFPA 13, 9.2.4.
 4. All hangers to be a maximum of 12 inches from the end of a branch line or an arm-over for a drop.
 5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 6. Where several pipes can be installed in parallel and at same elevation, provide multiple trapeze hangers may be used.
 7. Provide copper plated hangers and supports for copper piping.
 8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed. cast inserts. The Contractor shall provide, layout, and install these inserts prior to placement of concrete.
- I. Slope piping and arrange systems to drain at low points.
- J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Do not penetrate building structural members unless indicated.
- L. Provide sleeves when penetrating floors and wall. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.
- N. Die cut threaded joints with full cut standard taper pipe threads and connect with Teflon tape or Teflon pipe compound applied to male threads.
- O. Install valves with stems upright or horizontal, not inverted.
- P. Provide valves for shut-off or isolating service and where shown on plans.
- Q. Provide drain valves at main shut-off valves, low points of piping and apparatus.
- R. Install piping in attic directly on top of joists. Install plastic sheeting over top of pipe and secure joists. Insulation to be installed over pipe and plastic sheeting.

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SECTION 15010 – GENERAL PROVISIONS-HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. HVAC means Heating, Ventilation and Air Conditioning.
- B. Provisions of this Section apply to all HVAC and Control work.
- C. Include the provisions of General, Supplementary and Special Conditions and provisions of the Specifications shall apply to and form a part of this Section.
- D. Provide all labor, materials, equipment, and services necessary for the completion of all HVAC work shown or specified, except work specifically specified to be done or furnished under other sections of the Specifications. Include performing all operations in connection with the complete HVAC installation in strict accordance with the specification and applicable drawings subject to the terms and conditions of the Contract.
- E. Give required notices, file drawings, obtain and pay for permits, deposits and fees necessary for the installation of the HVAC work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.
- F. "Provide" means to furnish and install, complete and ready for operation.
- G. All equipment shall be U.L. or E.T.L. Listed as an assembly.

1.02 DRAWINGS

- A. HVAC Drawings are diagrammatic and subject to requirements of Architectural Drawings. HVAC Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work. Coordinate with Architectural, Structural, Electrical, Plumbing and other Building Drawings.
- B. Follow the Drawings closely, check dimensions with Architectural Drawings and field conditions. DO NOT scale HVAC Drawings for location of system components.
- C. Make no changes without Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or mislocated work.
- D. Do not scale Drawings to locate ceiling diffusers. Coordinate with lighting, ceiling grids and/or reflected ceiling plans.

1.03 APPLICABLE CODES AND STANDARDS

- A. Comply with the current editions of the following Codes and Standards:
 - 1. ANSI/ASHRAE 15 - Code for Building Services Piping.
 - 2. ANSI B9.1 - Safety Code for Mechanical Refrigeration.

3. NFPA 70 - National Electrical Code.
4. NFPA 90A - Air Conditioning and Ventilating Systems.
5. NFPA 91 - Blower and Exhaust Systems.
6. NFPA 101 - Life Safety Code.
7. NFPA 96 Commercial Cooking Equipment, Vapor Removal.
8. Other Standard as referenced in other Sections of Divisions 15.
9. Local Building Code (International Building Code if no local Building Code in effect).
10. Local Plumbing Code (International Plumbing Code if no local Plumbing Code in effect).
11. Local Gas Code (International Gas Code if no local Gas Code in effect).
12. Local Mechanical Code (International Mechanical Code if no local Code in effect).

1.04 QUALIFICATIONS OF SUBCONTRACTOR

- A. The HVAC Contractor shall meet the following qualifications:
1. The HVAC Contractor must be approved by the Architect.
 2. The HVAC Contractor shall have been in business as a HVAC Contractor for at least three (3) years prior to Bid Date.
 3. The HVAC Contractor shall have a satisfactory experience record with HVAC installations of character and scope comparable with this project and have completed five projects of the same cost (or more) as the cost of this project, and for at least three (3) years prior to the Bid Date shall have had an established service department capable of providing service inspection or full maintenance contracts.
 4. Contractor must have bonding capacity for project of this size and must bond the project.

1.05 CONFLICTS AND INTERFERENCES

- A. If systems interfere or conflict, the Architect shall decide which equipment to relocate regardless of which was first installed.

1.06 WORKMANSHIP

- A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

1.07 COOPERATION

- A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

1.08 VISITING SITE

- A. Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.

PART 2 - PRODUCTS

2.01 MATERIALS, SUBSTITUTIONS AND SUBMITTALS

- A. Unless otherwise noted, provide new, standard, first-grade materials throughout. Equipment and materials furnished shall be fabricated by manufacturer regularly engaged in their production and shall be the standard and current model for which replacement parts are available. HVAC equipment shall be substantially the same equipment of a given manufacturer which has been in successful commercial use and operation for at least three (3) years.
- B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the Bid, without substitution, and shall be furnished under the Contract unless requests for substitutions are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.
- C. Substitutions will be considered only if written request for approval has been received by the Architect ten (10) days prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which substitution is proposed, specification section/paragraph number and a complete description of the proposed substitute including drawings, cuts, performance and test data, samples and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require shall be included. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.
- D. If the Architect approves any proposed substitution prior to receipt of Proposals, approval will be set forth in an Addendum. Do not rely upon approvals made in any other manner. Prior approval to be secured for "equal" or "approved equal" manufacturer.
- E. No substitutions will be considered after the Contract has been executed, except as described in the General Conditions.
- F. Submittal data and shop drawings, except controls, shall be submitted at one time, partial submittals will not be considered. Provide submittal in three (3) ring binders with tab sheets for each major item of equipment. Before ordering materials and equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Number of Shop Drawings and procedure shall be as directed by the Architect.

- G. Architect and / or Engineer's approval of submittal data does not relieve the contractor of his responsibility to comply with the contract documents.
- H. It is the responsibility of the Mechanical contractor to coordinate all Electrical requirements of the submitted equipment with the Electrical contractor. Any increase in cost due to a variance between the contract documents and the submitted equipment shall be the responsibility of the Mechanical Contractor.
- I. All pressure vessels shall be constructed and tested in accordance with applicable ASME Codes and shall bear ASME stamps. Certificates of inspection and approval shall be submitted to Architect.
- J. Similar items of equipment shall be the product of the same Manufacturer.
- K. See section, "ALTERNATES" in other section of the Specifications and Bid accordingly.

2.02 SHOP DRAWINGS

- A. Before starting work, submit and obtain approval of detailed drawings of the following, fully dimensioned (including elevations of ductwork and piping) and drawn not less than 1/4"= 1'-0" scale. Submit one (1) set of paper or bond.
 - 1. Ductwork (do not scale diffuser locations, coordinate with ceiling grids and lighting layout). See Section 15860 "DUCT ACCESSORIES".
 - 2. Plenum casings.
 - 3. Complete mechanical equipment and fan room plans showing location of equipment, conduit stubs for motors, floor drains, and equipment pads and foundations.
 - 4. Equipment piping.
- B. Submit complete control and power wiring diagrams for approval before installing controls. See Section 15900 "CONTROLS".

2.03 RECORD DRAWINGS

- A. When work starts, obtain white prints of the HVAC Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.
- B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one (1) complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this Contract.
- C. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.
- D. When work is completed Contractor shall purchase from the Architect (At Architects' printing cost) one (1) set of mylar reproducible prints of HVAC Drawings for use in

preparing record drawings. Contractor shall transfer the information from the marked white prints to the mylar record drawings, removing all superseded data in order to show the actual completed conditions.

1. Accurately shown location, size and elevation of new exterior piping work and its relationship to any existing piping and utilities, obstructions, etc., contiguous to the area of work.
 2. Block out areas modified by change-order and identify them by change-order number.
- E. Ductwork and Control Drawings may be a set of mylar reproducible shop drawings, up-dated to show actual conditions at completion of work.

2.04 MOTORS, STARTERS AND ELECTRICAL EQUIPMENT:

- A. Provide electrical equipment compatible with the current shown on electrical drawings. Verify current characteristics before ordering equipment.
- B. Should the Contractor with the Architect's approval make changes in electrical equipment from those shown on the Electrical Drawings, he shall be responsible for the coordination and cost of required changes.
- C. Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.
- D. Motors:
 1. 1750 RPM open drip-proof construction unless otherwise shown or specified. Integral horsepower three phase motors shall be of premium energy-efficient design with apparent efficiency (power factor X efficiency) not less than ASHRAE 90.1.
 2. All motors served by variable frequency drives (VFD's) shall be inverter duty rated.
 3. Unless shown otherwise motors less than 1/2 HP shall be single phase, motors 1/2 HP and larger shall be three phase.
 4. Allis-Chalmer, General Electric, Goulds, Louis Allis, and Westinghouse.
- E. Do not run motors until correct overload elements are installed in starters. Trading overload elements for elements of correct size for motors actually furnished shall be included in this Section.
- F. Starters shall be in motor control centers, furnished mounted on packaged equipment or furnished in this section and installed under "ELECTRICAL SECTION" as indicated and/or shown on the Electrical Drawings. All starters furnished with fused control circuit transformers.
- G. Starters shall be equipped with melting alloy terminal overload protection, in a 3 phase. Starters, unless indicated otherwise, shall be across-the-line type with overload and low voltage protection. Starting equipment shall comply with local utility company requirements.

- H. Starters to be Square "D", Allen-Bradley, Cutler-Hammer or approved equal.
- I. For single phase motors provide manual starters equal to Square "D" Class 2510. When installed in equipment rooms provide surface mounted enclosure, and when installed in finished walls outside equipment rooms provide flush mounted enclosure, key operated.
- J. For three phase motors provide magnetic line voltage starters with NEMA I enclosures and melting alloy overload elements.
- K. Provide non-fused combination magnetic line voltage starters with NEMA I enclosures and melting alloy overload protection.
- L. Provide H-O-A switches, fused control circuit transformers, auxiliary contacts, etc., as shown on control diagrams or required by control sequences and/or arrange for these items to be furnished with the starters or motor control centers specified in Electrical Work.
- M. All starters shall be by the same manufacturer.
- N. Provide thermal overload with equipment for motors 1/2 HP and less at 120/1/60.

2.05 SLEEVES

- A. For pipe through floors inside rated chases or through non-fire-rated walls: 20 gauge galvanized steel, 1/2" larger than pipe or covering.
- B. For uninsulated pipe through fire rated walls or partitions or floors outside chases: Pipe Shields, Inc., Model WFB or approved equal at walls, Model DFB at floors.
- C. For insulated pipe passing through fire rated partitions or walls or floors outside chases: Pipe Shields, Inc., Model WFB-CS for hot lines, VFB-CS-CW for cold lines. Insulation: Calcium silicate for hot lines and foamglass for cold lines, thickness specified for adjacent pipe covering.
- D. For pipe through concrete beams: Schedule 40 black steel pipe, 1/2" larger than pipe or covering. Pipe covering passing through sleeve: calcium silicate in a 24 gauge galvanized steel shield similar to Pipe Shields, Inc. thermal hanger shield. Caulk space between bare pipe insulation jacket and beam with fire retardant rope at both ends of the sleeve and seal with 3M Brand fire barrier caulk CD 25 or Putty 303, thickness and application in strict accord with manufacturer's recommendations, minimum thickness 1".
- E. At Contractor's option, instead of the factory fabricated sleeves specified above for pipe passing through floors and fire rated walls and partitions substitute 20 gauge galvanized steel sleeve 1/2" larger in diameter than pipe or pipe covering and seal one end of sleeve (both ends if both ends are exposed) with 3M Branch Fire Barrier Caulk CP25 or Putty 303, thickness and application in strict accord with manufacturer's recommendations, minimum thickness 1". Where pipe is insulated, insulation shall be continuous thru sleeve, calcium silicate for hot lines and foamglass for cold lines. In exposed areas, after product has dried it shall be sanded smooth for painting under painting section.
- F. Set sleeves before concrete is poured or masonry is erected. In existing construction, grout sleeves firmly in place.

- G. Sleeves for ducts: See Fire Dampers (See Section 15860 "DUCT ACCESSORIES").
- H. Extend sleeves 1-1/2" above finish floor and waterproof.
- I. Where exposed ducts pass through walls and partitions, provide 4" wide 20 gauge galvanized steel closure plates except at grilles and registers. Fit closure plates snugly to duct and secure to wall. Grout around ducts and sound absorbers at equipment room walls.
- J. Where exposed pipes pass through walls and partitions in finished spaces, provide chrome plated F & C plates or escutcheons.

2.06 ACCESS DOORS

- A. Doors in non-fire rated walls and ceilings: 17-gauge steel with hinges and screwdriver latches, Bilco, Milcor, Miami-Carey, or equal. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Provide door styles compatible with adjoining surfaces as selected by Architect. Size doors to permit removal of equipment and/or maintenance, minimum size 18" X 18".
- B. Mark lay-in ceilings with paper brads at maintenance access points. Bend ends of brads over above ceiling tile.

PART 3 - EXECUTION

3.01 PROTECTION OF ROTATING PARTS

- A. Equip exposed belt drives with belt guards with holes for measuring speeds of driven shafts.
- B. Provide exposed couplings with coupling guards.
- C. Equip propeller fans with guards.
- D. Equip inlets and outlets of open centrifugal fans with 1-1/2" #10 Diamond mesh galvanized steel screens.
- E. All motors or other equipment exposed to weather shall be provided with weatherproof covers.

3.02 PROTECTION OF EQUIPMENT

- A. During construction, protect mechanical equipment from damage or deterioration.
- B. When installation is complete, clean equipment and make ready for painting.
- C. During construction all ductwork, piping, and equipment shall be stored in a clean/dry location. Any ductwork or piping stored outside that is not protected shall be removed from the job site. Installed ductwork and piping shall have open ends covered at the end of each work day to prevent dust, dirt, and water from entering the ductwork and piping.

3.03 INSTALLATION OF EQUIPMENT

- A. Install equipment to provide normal service access to all components.

- B. Provide sufficient space for removing components, install equipment to provide such clearance.
- C. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.
- D. All equipment shall be firmly fastened in place:
 - 1. Roof curbs shall be secured to deck and structure and curb mounted items shall be secured to curbs.
 - 2. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
 - 3. Vibration isolators shall be secured to floors, pads or structure and equipment shall be bolted to the isolators.

3.04 EQUIPMENT SUPPORTS

- A. Provide supports for ductwork, piping and equipment. Hot dip galvanize after fabrication all grillage, supports, etc., located outdoors.
- B. Set all floor-mounted equipment, other than condensate pumps, on concrete pads or rails (as indicated of height shown, but not less than 4" high). Coordinate pad height with condensate drain trap requirements. Chamfer rails and pads 1". Where shown, provide reinforced floating pads mounted on vibration isolators. Form, reinforce and pour any pads and rails required but not shown on Structural and Architectural Drawings.

3.05 CUTTING AND PATCHING

- A. Set sleeves and inserts and lay-out and form openings in walls, beams, girders and structural floors in this Section.
- B. Cut, patch and repair as required to accomplish HVAC Work and finish to match adjacent work. Architect's approval required before cutting any part where strength or appearance of finished work is involved.

3.06 INCIDENTAL WORK

- A. Provide all motors incidental to the Mechanical Systems. Wiring of motors, switches and starters is included in "ELECTRICAL SECTIONS".
- B. Do all control wiring required for Mechanical work.
- C. Provide motor starters as specified above.
- D. Submit refrigerant piping diagrams as prepared by the HVAC Contractor and/or refrigeration equipment manufacturer for approval.
- E. Final water connections to services are included in this Section.
- F. Permanent drain connections for AC units, etc., and auto air vents to nearest floor drain

are included in this Section.

- G. Door louvers are not included in this Section.
- H. Items obviously omitted from drawings and/or specifications shall be called to attention of the Architect prior to submitting Bid, after award of Contract any changes or rearrangements necessary to complete Contract shall be at no additional cost to Owner.
- I. All return air and exhaust air grilles shall be covered with filter media if they are started and operated during construction.

3.07 FLASHING

- A. General: Furnish all fans curbs, pitch cups, metal base flashing and counter flashing required for HVAC Work. Installation of above items is specified in "ROOFING SECTION" with coordination by HVAC Contractor.
- B. Fan curbs for power roof ventilators are specified with the fans.
- C. Pitch Cups: 20 gauge galvanized steel, at least 8" deep, bases mitered and soldered and extending at least 4" horizontally.
- D. Metal Base Flashing: Galvanized steel for ferrous items, and stainless steel for stainless steel duct and aluminum for aluminum duct. Minimum thickness 22 gauge (0.034") galvanized steel, 20 gauge (0.038") stainless steel, 0.032" aluminum. Bases mitered and soldered extending out at least 4" horizontally and 8" vertically.
- E. Metal Counter Flashing: Of material and gauges specified for base flashing, lapping base flashing at least 3".

3.08 EXCAVATION AND BACKFILLING

- A. Include all excavation and backfilling required to bring the work to line and grade shown, including excavation of rock and all other materials which may be encountered.
- B. Excavate trenches wide enough for proper installation of work. Grade trench bottoms evenly. Provide bell holes as necessary to insure uniform bearing for pipes. Excavate minimum 6" below pipe. Refill cuts below required pipe grade with sand or compacted gravel. Support pipe continuously along its entire length. Do not use piers to support piping.
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas with "Engineered Fill", sand or fine gravel in accordance with requirements of "Sitework". Backfill paved areas with sand or fine gravel compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe. Restore or repair pavements and the like after backfilling, matching adjacent work.

3.09 DEMOLITION:

- A. Certain existing HVAC equipment to be removed and/or relocated as shown or noted. Equipment removed will remain the property of the Owner unless designated otherwise. Remove from the premises all items not retained by the Owner.

3.10 HVAC INSTALLATION OF AND CONNECTIONS TO ITEMS FURNISHED BY OTHERS
OR SPECIFIED IN OTHER SECTIONS

- A. Duct Mounted Smoke Detectors: Install in duct.
- B. Domestic Water Heaters: Provide gas flues and combustion air vents.

3.11 PAINTING

- A. Refinish equipment damaged during construction to new condition.
- B. Paint all non-potable water pipe and insulation yellow in accordance with Plumbing Code using paint of type specified in Painting Section.
- C. Paint un-insulated duct surfaces visible through grilles and registers flat black.
- D. Other painting is specified in "PAINTING SECTION, Finishes Division".

3.12 PIPE IDENTIFICATIONS

- A. Identify all piping exposed to view or accessible through removable ceilings or access panels with plastic snap-on pipe line markers. Color code markers in accordance with ANSI A13.1. Show pipe contents and direction of flow. Markers on lines 8" OD and smaller shall be taped in place; on lines over 8" OD secure with spring clips.
- B. Submit samples of all labels, tags, stencils, chains, etc., for approval.
- C. Protect all factory identification tags, nameplates, model and serial numbers, stenciling, etc., during construction and replace if damaged.
- D. Label Spacing and Extent:
 - 1. On straight run of pipes; Above suspended ceilings space labels approximately 10 feet on center; elsewhere, 20 feet on center.
 - 2. Wherever a pipe enters or leaves a room or building.
 - 3. At change of direction.
 - 4. At main valves and control valves (not equipment valves).
 - 5. On risers, just above and below floors.

3.13 EQUIPMENT IDENTIFICATIONS

- A. Provide 2" X 3" or larger laminated plastic nameplates with 1/2" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tags, leaving lower half of tag for future engraving by Owner.
- B. Provide similar nameplates for motor starters furnished under this section.
- C. Secure nameplates with acorn head screws.

- D. Colors:
 - 1. Equipment connected to utility power only - black letters on white nameplates.
 - 2. Equipment connected to emergency power - red letters on white nameplates.
- E. In existing building replace all existing nameplates which do not comply with above colors.

3.14 EXHAUST FAN IDENTIFICATIONS

- A. 2" X 3" or larger laminated plastic nameplates with red letters and numbers on white background, identifying type of fans, number according to plans, and rooms served. Engrave on upper half of tag, leaving lower half for engraving by Owner. Fasten with acorn head screws.

3.15 ACCESS DOORS

- A. Provide access doors for valves, fire dampers, dampers, controls, air vents, and other items located above non-lift-out ceilings or behind partitions or walls.

3.16 USE OF HVAC SYSTEM DURING CONSTRUCTION

- A. Ducted HVAC systems may be used during construction as long as the following conditions are met:
 - 1. All AC units shall have filters installed in the AC units that are equal to the filters that are scheduled for each piece of equipment. The contractor shall be responsible for changing the filters in all AC units during construction at a minimum of every 30 days starting from the day the AC units are started. At the completion of the project, the contractor shall replace all filters.
 - 2. All return air and outside air openings shall be protected with temporary filter media. The temporary filter media shall be changed by the contractor. Temporary filter media is required to protect the installed ductwork. During or after construction, if any ductwork is observed without temporary filter media, the contractor shall be solely responsible for cleaning the entire ductwork system and AC unit. Temporary filter media shall be changed bi-weekly at a minimum.
 - 3. All AC units shall have all correct motor overload elements installed and all safeties shall be wired and operational prior to temporary use of the AC unit.
 - 4. Temporary controls and temporary control sequences may be utilized by the contractor until the permanent controls and control sequences are installed. Temporary control methods shall be the sole responsibility of the contractor.
 - 5. All AC units required to have factory start-up shall have factory start-up completed prior to use.
 - 6. The building envelope for the area served by the AC units shall be substantially complete prior to using the AC units during construction.
- B. Ductless split systems shall NOT be used during construction. Protect all indoor sections

of ductless split systems during construction to prevent dust, dirt, or water from entering the unit.

3.17 WARRANTY AND INSTRUCTIONS

- A. See General Conditions - One-Year Warranty.
- B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one (1) year after date of substantial completion of the Contract. Should any defects in materials, workmanship, or equipment be made known to Contractor within the one (1) year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.
- C. All centrifugal, reciprocating, screw or scroll type refrigeration compressors shall bear five (5) year non-pro-rated parts warranty.
- D. All gas fired air furnaces shall bear ten (10) year prorated heat exchanger warranties.
- E. After completion of the work, Contractor shall operate the equipment which he installs for a period of ten (10) working days, as a test of satisfactory operating conditions. During this time, Contractor shall instruct the Owner's operating personnel in the correct operation of the equipment. Furnish necessary oral and written operating instructions to the Owner's representative.
- F. Provide five (5) sets of manufacturer's operating and maintenance manuals and parts lists including nearest manufacturer's sales and service representative by name, address and phone for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency. Include all warranty dates on equipment and guarantees. Include names, address and phone of any subcontractor and work performed. Bind above items in loose leaf three (3) ring binders with tab for each class of equipment.
- G. During the period of tests, adjust all controls, regulators, etc., to comply with these Specifications.
- H. Supply initial charges of refrigerant, refrigeration lubricating oil; and anti-freeze necessary for the correct operation of the equipment. Maintain these charges during the guarantee period, with no additional cost to the Owner, unless loss of charge is the fault of the Owner.
- I. Make available to the Owner, without additional cost, service and adjustment of the equipment for the guarantee period.
 - 1. Service shall include:
 - a. On call nuisance issues.
 - b. Replenishing refrigerant and antifreeze if loss occurs due to system failure.
 - 2. Service shall not include:
 - a. Routine maintenance of the equipment unless specified in specific

equipment specification section(s).

3.18 PROJECT CLOSE-OUT DOCUMENTS

- A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
1. A letter signed by the subcontractors for HVAC, Electrical, and Temperature Control work stating that they have jointly checked each power circuit and control circuit and mutually agrees that controls and power circuits will function properly.
 2. Record drawings - sheet metal work (reproducible).
 3. Air balance report (3).
 4. Equipment Submittal Data (3).
 5. Equipment operating and maintenance manuals (3).
 6. Maintenance schedule (3).
 7. Equipment warranty dates and guarantees (3).
 8. List of Owner's Personnel who have received maintenance instructions.

END OF SECTION 15010

SECTION 15020 – TESTING, BALANCING AND ADJUSTING (TBA)

PART 1 - GENERAL

1.01 SCOPE

- A. Provisions of this section apply to all HVAC work.
- B. All tests shall be witnessed by the Architect in addition to authorities having jurisdiction. A minimum of 48 hour notice is required prior to performance of test.
- C. Provide complete report to Engineer for approval TEN (10) working days prior to Engineer's final site visit.

1.02 QUALIFICATIONS

- A. All TBA work shall be performed by an independent Test and Balance Agency specializing in Testing, Balancing and Adjusting of HVAC Systems.
- B. All TBA work shall be under supervision of a qualified registered professional engineer regularly engaged in the TBA Agency.
- C. TBA Agency shall be an AABC or NEEB Member and/or shall obtain written approval from the Architect prior to Bidding.

1.03 APPROVAL

- A. Application for approval of the TBA agency shall be submitted prior to Bid.
- B. Submittal information regarding the TBA agency to include:
 - 1. List of at least five (5) projects successfully completed of similar size and scope.
 - 2. Copy of reporting forms to be used for this project indicating scope of TBA work.
 - 3. Name of registered engineer in charge with resume of qualifications. List of personnel that will perform TBA work on project and qualifications.
 - 4. List of instruments to be used with dates of latest calibrations.
 - 5. List of memberships in AABC, NEBB or other similar organizations.

PART 2 - PRODUCTS

2.01 INSTRUMENTS

- A. All instruments used for the TBA work shall be calibrated within six (6) months and checked for accuracy prior to start of work.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Prior to any work beginning perform, a pre-demolition test of all existing systems being affected by the renovation and/or the addition. Submit Test and Deficiency List as indicated below.
- B. After HVAC system has been installed, Test, Balance and Adjust System for proper operation, air distribution, flow rates, temperatures and humidities. Correct any noise and/or vibration conditions.
- C. Include a "Deficiency List" with the TBA air and water balance report. Deficiency list shall include TBA items which are not in accordance with Contract Documents.
- D. Perform all tests as required by local codes. Contractor shall furnish testing equipment.
- E. If local Codes are more stringent, local Codes shall govern.

3.02 AIR SYSTEM

- A. When system has been completed, remove all trash and dirt, set grille bars and diffuser patterns for required throws and adjust and balance air duct systems so air quantities at outlets are as directed and distribution from each supply outlet is free from drafts and excessive noise, and uniform over the face of each outlet. Do all testing and balancing with filters blanked to provide pressure drops midway between clean condition and manufacturer's recommended change-out condition. Balance air quantities to within 10% of indicated air quantities.
- B. Make adjustments so dampers and volume adjusters close to air outlets will have the least pressure drop consistent with volume requirements. Obtain additional pressure drop required for balancing of shorter runs by adjusting dampers at branch duct take-offs. Adjustable fan drives shall be used for making final adjustments of total air quantities. Change sheaves and belts as required to adjust AC units to proper airflow.
- C. Direct reading velocity meters may be used for comparative adjustment of individual outlets, but measure air quantities in ducts having velocities of 1000 feet per minute or more with pitot tubes. Cap pitot tube openings in low pressure ducts with plastic plugs. Cap pitot tube openings in medium and high pressure ducts and kitchen and laboratory exhaust ducts with Duro-Dyne test ports.
- D. Permanently mark settings of dampers and other volume adjusting devices so they can be restored if disturbed.
- E. When air balancing has been completed, submit to Architect an air balance log, including design and actual air quantities, pressures, etc., in each branch duct and at each grille, register, and outlet. Individual outlet air rates are required for boots on boot-box systems.
- F. Include for each system the following information:
 - 1. Fan rpm, motor amps, motor nameplate amps, and amp rating of starter heater.

2. Total air quantity supplied by each system and/or fan.
3. Total outside air quantity supplied by each system.
4. Provide velocity pressure across each duct mounted smoke detector and list manufacturer's required velocity pressure range.
5. Air flow at all grilles.

3.03 COILS

- A. Provide the following:
 1. Entering and leaving air temperatures.
 2. Outside air temperature at time of test.
 3. Air pressure drop.

3.04 START-UP AND SERVICE

- A. At the beginning of the first heating season, adjust and balance operating phases and repeat at the beginning of the first cooling season or vice-versa, as the case may be, all without charge.
- B. The Contractor and Factory Representative of the boilers, chillers, AC units and major HVAC equipment shall place every item of such equipment into satisfactory operation with all automatic and safety devices. Further, all adjustment service required shall be performed during the warranty period. Adjustment services does not include lubricating fans or motors and does not include changing filters or adjusting belts.
- C. In addition, submit equipment manufacturers' start-up reports for items listed above. See "Project Close-Out".

END OF SECTION 15020

SECTION 15050 – MATERIALS AND METHODS-HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. Include Section 15010, "GENERAL PROVISIONS - HVAC", with this Section.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All pipe, fittings and valves shall be manufactured in the United States of America.

2.02 HVAC DRAIN PIPING

- A. Standard weight galvanized steel pipe ASTM A-120 with galvanized malleable iron fittings, or type "L" hard copper with wrought copper sweat fittings or Schedule 40 PVC, at Contractor's option.
- B. Provide drain traps for AC Unit drain pans. Size traps as required to drain under operating conditions.

2.03 REFRIGERATION PIPING

- A. ACR hard drawn copper tubing with wrought copper sweat fittings. Joints: Silfossed with continuous flow of dry nitrogen through lines.
- B. Size suction and discharge lines so as to insure oil return at minimum loading.
- C. Small lines 5/8" OD and smaller may be soft copper with flare fittings, provided that all joints are exposed for visual inspection.
- D. Refrigerant piping shall be sized and installed as recommended by the equipment manufacturer. Provide lift traps or double suction risers as required for oil return.

2.04 PIPE HANGERS

- A. General: Pipe hangers, Grinnell, PHD, Michigan Hanger, or Elcen. Grinnell figure numbers are given for reference. Provide copper clad or plastic coated hangers on bare copper lines. Provide stainless steel or plastic coated hangers in Pool areas subject to chlorine atmosphere.
- B. Pipe hangers for lines 3" and smaller (other than steam and condensate lines), adjustable wrought ring hangers, Grinnell Fig. 97 or wrought clevis hangers, Grinnell Fig. 260.
- C. Pipe hangers for lines 4" and larger (other than steam and condensate lines), adjustable wrought ring hangers, Grinnell Fig. 260.
- D. Parallel piping graded in same direction may be grouped on trapezes. Trapezes for line 4" and smaller, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze. Guide lines on (but not anchor to) trapezes using Unistrut Series P1100 clamps. Trapezes shall not exceed 3' in length. Space lines to allow at

least 3" clear between adjacent pipe or pipe covering and between pipes or pipe covering and rods. Space trapezes as specified for pipe hangers based upon smallest size of pipe on trapeze.

- E. Beam Clamps: Grinnell Fig. 229.
- F. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Grinnell Fig. 282.
- G. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (power driven anchors are not acceptable).
- H. Size rods for pipe hangers not smaller than the following: 3/8" rods for pipe up to 2", 1/2" for 2-1/2" and 3" pipe, 5/8" rods for 4" and 5" pipe, 3/4" rods for 6" pipe, and 7/8" rods for 8" and 10" and 12" pipe, 1" rods for 14" and 16" pipe and 1-1/8" rods for 18" pipe.
- I. Space pipe hangers at maximum: Pipe hanger spacing for screwed, solder joint and welded piping: 1/2", 6 ft.; 3/4" to 1-1/4", 8 ft.; 1-1/2" to 2-1/2", 10 ft.; 3", 12 ft.; 4", 14 ft.; 5", 12 ft. 6", 10 ft., 8" and over, 6 ft. Polypropylene and PVC plastic pipe 4 ft. horizontally maximum or as directed by manufacturer if closer, and 10 ft. vertically. Install additional hangers at change of direction and valve clusters.
- J. Install pipe hangers on insulated pipe (other than steam and condensate lines) over pipe covering. Provide factory fabricated insulated pipe shields equal to Pipe Shields, Inc. "Thermal Hanger Shields" at hangers. Provide shield insulation of waterproofed calcium silicate for hot water piping and foamglass for chilled water piping, same thickness as adjacent pipe covering. At Contractor's option, pipe shields may be field fabricated using waterproof calcium silicate or foam glass insulation with ASJ and 20 gauge galvanized steel protector. Shield length: 1.5 times nominal pipe size but not less than 4".
- K. Wrap bare copper refrigerant lines with sheet lead at hangers.

2.05 THERMOMETERS AND GAUGES

- A. Mercury in glass red reading separable socket industrial thermometers with die cast metal or high impact plastic casings of appropriate pattern for each installation, 9" scale lengths and ranges shown, Palmer, Trerice, Weksler, Marsh or equal. Install thermometers in brass or stainless steel wells. Equip thermometers installed in insulated lines with 1" extension stems or long enough to permit unions to clear insulation whichever is greater.
- B. Where shown install brass thermometer wells with screwed caps. Install wells at an angle to retain oil. Size well to fit thermometers specified.
- C. Enlarge pipe 2" and smaller to 2-1/2" at thermometers and thermometer wells.
- D. Install 4-1/2" dial pressure gauges where shown. Gauges shall have bronze or stainless steel bourbon tubes, 316 stainless steel or brass movement, non-ferrous or phenolic solid front cases, and accuracy not less than 1% of full scale over the entire range. Gauges shall be Ashcroft, Trerice, Weksler, U.S., Marsh or equal. Gauge with minimum bourbon tube diameter of 3". Provide brass or stainless bar stock needle valves for all pressure gauges. Provide siphons for steam gages.
- E. Where shown, provide temperature and pressure measurement plugs and caps, equal to

Peteron Equipment Co., Inc. "Pete's plug with Nordel seats and seals", flow design or approved equal. Provide one Pressure and Temperature Kit consisting of 0-100 psi pressure gauge with adapters, two (2) thermometers (25E - 125E F and 0E - 220E F), all in carrying cases.

PART 3 - EXECUTION

3.01 PIPE INSTALLATION

- A. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.
- B. Provide welding material and labor in accordance with the welding procedures of the Heating, Piping, and Air Conditioning Contractors' National Association or other approved procedure conforming to the requirements of ANSI B31.9 "Building Service Piping". Employ only welders fully qualified in the above specified procedure and currently certified by recognized testing authority. Use either electric arc or oxyacetylene welding. Provide full perimeter welds at both face end and collar end of each slip-on flange.
- C. Install piping to allow for expansion. Make connections to all equipment to eliminate undue strains in piping and equipment. Furnish necessary fittings and bends to avoid spring of pipes during assembly.
- D. Pitch air conditioning unit drain lines down in direction of flow 1" in 20'.
- E. Install chrome plated floor and ceiling plates on pipe passing through finished surfaces in finished spaces.
- F. Install 3/4" ball or gate valve drains with hose adapters at low points of water piping and at bases of all risers or where shown provide large drains.
- G. Make connections to equipment using screwed unions in sizes 2" and smaller and flanged unions in sizes 2-1/2" and larger. Install unions in all piping connections to each piece of equipment. Provide rubber grommets at pipe penetrations to equipment casings.
- H. Wherever ferrous pipes or tanks and copper tubing connect, provide dielectric insulation unions or couplings, equal to EPCO.
- I. Near heating and air conditioning equipment requiring water valved and capped water outlets of sizes shown, for connection to equipment, including reduced pressure principal backflow preventers shall be provided. Make final connections under HVAC work. Note that all piping and insulation downstream of backflow preventer must be painted yellow.
- J. Run piping concealed, except where specifically shown or specified exposed. Plumb all vertical lines and run mains parallel to building walls unless specifically shown otherwise. All piping shall be run as high as practical and not on the floor unless otherwise indicated.

3.02 REFRIGERATION SYSTEM

- A. Split Systems: When system is complete, but before the pipe covering has been installed, test components with dry nitrogen and make tight at equipment manufacturer's

recommended test pressures. Then evacuate the system to 26" Hg. vacuum which the system shall hold for 24 hours. After passing the above tests, charge and leak test under operating conditions using electronic leak detector.

- B. Split and Packaged Systems: Check operation of refrigeration cycle and report head pressure, suction pressure and oil pressure.

END OF SECTION 15050

SECTION 15080 – PIPING SPECIALTIES-HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. Provisions of this section apply to all HVAC work.

PART 2 - PRODUCTS

2.01 SPECIALTIES - REFRIGERANT

- A. Install molded desiccant core filter dryer in each liquid line. Provide throw away dryers for lines 1/2" and smaller. Provide replaceable core dryers for lines 5/8" and larger. Dryers shall be Sporlan "Catchall".
- B. Install moisture indicating sight glass in each liquid line.
- C. Service valves: Wing cap valves, Henry, or approved equal.
- D. Expansion valves: Thermostatic valves with external equalizers, Sporlan, or approved equal.
- E. Install solenoid valve in each liquid and hot gas bypass line. Hot gas solenoid valve shall be equipped with a high temperature coil.
- F. Install suction line accumulators in all outdoor heat pumps and condensing units where refrigerant lines exceed 85' in length, or where recommended by manufacturer.
- G. Refrigerant circuit access ports located outdoors shall be fitted with locking-type, tamper-resistant caps. Provide owner with any tools necessary to un-lock the caps.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Specialties shall be installed in accordance with manufacturer's recommendations.
- B. See Details for mounting instructions and accessories.

END OF SECTION 15080

SECTION 15180 – INSULATION-HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. Include Section 15010 "GENERAL PROVISIONS - HVAC", with this Section.
- B. Repair existing insulation at points of connection to existing work.
- C. "Exposed" is defined as: Exposed to view when construction is complete. Items which are not "exposed" are "concealed".
- D. "Attic" is defined as any ceiling space that is adjacent to the roof.
- E. Insulate all items subject to sweating or loss of heat.
- F. All insulation shall be installed by licensed applicator and applied in accordance with the Manufacturer's Recommendations.

1.02 INSULATION REQUIREMENTS

- A. Comply with NFPA 90A.
- B. Pipe hanger shields are specified in Section 15050 "MATERIALS AND METHODS - HVAC".
- C. Use insulation and adhesives with Underwriter's Laboratories flame spread rating not over 25 without evidence of continued progressive combustion, and smoke developed rating not exceeding 50 for all other pipe, duct and equipment insulation.

PART 2 - PRODUCTS

2.01 FOAM PLASTIC PIPE COVERING

- A. Fire retardant foamed plastic pipe covering, maximum K factory at 75EF mean temperature not exceeding 0.27 BTU/(hr) (sq. ft.) (EF/in). Armstrong "Armaflex II", or approved equal.
- B. Pipe covering may be seamless insulation slipped over piping before erection or may be slit longitudinally and installed over erected piping.
- C. Make fitting covers from segments of pipe covering.
- D. Cement all joints and seams in accordance with manufacturer's instruction using Armstrong 520 adhesive.
- E. Fit pipe hangers over insulation (See PIPE HANGERS). Use hanger shields as specified under pipe hangers.
- F. Thermal performance shall be as follows:
 - 1. 1" thick: R=4.2.
 - 2. 2" thick: R=8.0.

2.02 ALUMINUM JACKET PIPING COVER

- A. 0.010" thick corrugated aluminum jacket with laminated polyethylene and draft paper adhered liner.
- B. Securely rivet jacket in place and band with flat aluminum bands 18" o.c.
- C. Finish fittings on aluminum jacketed lines with 1/8" thick (dry) coat of vinyl acrylic mastic reinforced with glass cloth.

2.03 DUCT INSULATION, EXTERNAL FOR CONCEALED

- A. Formaldehyde free flexible glass fiber insulation with foil-scrim-craft (FSK) facing equal to Johnson Manville Micro-Lite AXG@. Flame spread classification, 25 or less, smoke developed rating not exceeding 50. Minimum density, 3/4 lb./cu. ft., 3" thickness, installed R=8.3 minimum.

PART 3 - EXECUTION

3.01 HVAC PIPING INSULATION

- A. Refrigerant Suction Lines and Hot Gas Bypass Lines: "Foam Plastic Pipe Covering", 1" thick. Jacket piping located outdoors or exposed to view with aluminum jacket.
- B. AC Unit Drain Lines: "Foam Plastic Covering", 3/4" thick. Jacket piping exposed to view with aluminum jacket.

3.02 AIR TERMINAL DEVICES

- A. Ceiling Mounted Supply Diffusers: 3" thick duct insulation on back of diffuser, external for concealed.
- B. Fire Dampers for Internally Lined Ducts and Externally Insulated Ducts: 3" thick duct insulation on all sides, external for concealed.

3.03 DUCT INSULATION, EXTERNAL, FOR CONCEALED DUCTS

- A. Adhere insulation to duct surface with approved adhesive applied in strips above 6" wide on approximately 12" centers. Flare door staples may be used for securing the insulation until the adhesive sets. Lap jacket and vapor seal all joints and seams with suitable mastic.
- B. On rectangular and flat oval ducts 30" wide and wider, additionally support insulation with weld pins and speed clips 18" on centers. Seal weld pins with mastic and FSK tape.
- C. Thickness and Extent:
 - 1. Supply, return, exhaust and outside air ductwork located in ceiling space where not called to be lined: 2.33" thick.
 - 2. Supply, return, exhaust and outside air ductwork located in attic space where

not called to be lined: 3" thick.

NOTE: Conical and straight spin-ins on both lined and unlined ducts shall be insulated. Insulation shall be slit at damper rods, at spin-ins and sealed vapor tight.

3.04 INSULATION WETTED DURING CONSTRUCTION

- A. Contractor shall replace any and all insulation wetted during construction at his own expense.

END OF SECTION 15180

SECTION 15205 - AIR PURIFICATION SYSTEM

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK:

- A. This section describes the design, performance and installation of an 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.

1.02 REFERENCED CODES & STANDARDS:

- A. The following codes and standards are referenced through out. 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 including ozone chamber test required as of December 21, 2007

1.03 RELATED WORK:

- 1. Testing, Adjusting and Balancing
- 2. Facility Access and Protection
- 3. Ductwork
- 4. Filters
- 5. Water and Refrigerant Piping
- 6. Electrical Wiring
- 7. Control Wiring

1.04 QUALITY ASSURANCE:

- A. Basis of design is Top Product Innovations. Global Plasma Solutions and Phenomenal Aire shall be considered equal subject to meeting all specifications herein.
- B. The Air Purification System shall be a product of an established manufacturer within the USA.

- C. 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.
- D. 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.
- E. Projects designed using ASHRAE Standard 62, IAQ Procedure shall require the manufacturer to provide Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2013 to validate acceptable indoor air quality at the quantity of outside air scheduled with the technology submitted.
- F. The Air Purification System have been tested by UL or Intertek/ETL to prove conformance to UL 867-2007 including the ozone chamber testing and peak ozone test for electronic devices. Manufacturers that achieved UL 867 prior to December 21, 2007 and have not been tested in accordance with the newest UL 867 standard with the ozone amendment shall not be acceptable. All manufacturers shall submit their independent UL 867 test data with ozone results to the engineer during the submittal process. All manufacturers shall submit a copy with their quotation. Contractors shall not accept any proposal without the proper ozone testing documentation.
- G. The maximum allowable ozone concentration per the UL 867-2007 chamber test shall be 0.007 PPM. The maximum peak ozone concentration per the UL 867-2007 peak test as measured 2 inches away from the electronic air cleaner's output shall be no more than 0.0042 PPM. Manufacturers with ozone output exceeding these ozone values shall not be acceptable.

1.05 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data for ion generators including:
 - 1. Schedule of plasma generators indicating unit designation, number of each type required for each unit/application.
 - 2. Data sheet for each type of plasma generator, and accessory furnished; indicating construction, sizes, and mounting details.
 - 3. Performance data for each type of plasma device furnished.
 - 4. Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2013 to validate acceptable indoor air quality at the quantity of outside air scheduled (when projects are designed with outside air reduction).
 - 5. Product drawings detailing all physical, electrical and control requirements.

- 6. Copy of UL 867 independent ozone test.
- B. Operating & Maintenance Data: Submit O&M data and recommended spare parts lists.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver in factory fabricated shipping containers. Identify on outside of container type of product and location to be installed. 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.

1.07 WARRANTY:

- A. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of twenty-four months after shipment, whichever occurs first. Labor to replace equipment under warranty shall be provided by the owner or installing contractor.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. The air purification system(s) shall be of the size, type, arrangement and capacity indicated and required by the unit furnished and shall be of the manufacturer specified.
- B. Basis of Design: Top Product Innovations Type C unit
- C. All other Suppliers of comparable products requesting prior approval shall:
 - 1. Submit for prior approval in accordance with the requirements of Section 15010.
 - 2. In addition, manufacturers submitting for prior approval for Bi-Polar Ionization must as part of the prior approval request provide their ASHRAE 62.1-2013 calculations that prove conformance to the ASHRAE Standard 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 showing ozone levels produced during the UL 867 ozone chamber test. Manufacturers without this test data shall not be acceptable.

2.02 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 Generator with Bi-polar Ionization output as described here within.
- B. The Bi-polar Ionization system shall be capable of:
 - 1. Effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.).
 - 2. Controlling gas phase contaminants generated from human occupants, building structure and furnishings.
 - 3. Capable of reducing static space charges.
 - 4. Increasing the interior ion levels, both positive and negative, to a minimum of 800 ions/cm³ measured 5 feet from the floor.
- C. The bi-polar ionization system shall operate in a manner such that equal amounts of positive and negative ions are produced. Uni-polar ion devices shall not be acceptable.
 - 1. Air exchange rates may vary through the full operating range of a constant volume or 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 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 within the air purification system. Air purification system shall be capable of wash down duty.
- E. Equipment Requirements:
 - 1. Electrode Specifications (Bi-polar Ionization):
 - a. Each Plasma Generator with Bi-polar Ionization output shall include the required number of electrodes and power generators sized to the air handling equipment capacity. Unit shall be capable of treating 6,000 CFM (C6.0) or 10,000 CFM (C10.0). Bi-polar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, performance output reduction over time, ozone production and corrosion.
 - b. Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating. Electrodes shall be made from carbon fiber to prevent oxidation over time.

- c. Electrode pair shall provide a minimum of 140 million ions per cubic centimeter (C6.0) or 200 million ions per cubic centimeter (C10.0), both positive and negative ions in equal quantities. Devices providing less than the rated ion densities shall not be acceptable.

F. Air Handler Mounted Units:

- 1. Where so indicated on the plans and/or schedules Plasma Generator(s) shall be supplied and installed. The mechanical contractor shall mount the Plasma Generator and wire it to the AHU control power (24VAC) as instructed by the Air Purification Manufacturer's instructions or line voltage subject to power available. Each unit shall be designed with an integral illuminated LED and dry contacts to prove ion output is operating properly. The dry contacts shall close to prove the ion generator is working properly and may be daisy chained in series such that only one dry contact per AHU is required to interface to the BAS or the optional DDC controller. Dry contacts proving power has been applied in lieu of the ion output is actually operating, are not acceptable.

- G. Plenum/Duct Mounted Units: Where so indicated on the plans and/or schedules, Plasma Generators(s) shall be supplied and installed. The generator shall be installed through the duct wall and into the air stream with the external power head in a convenient location for visual indication of power, removal and servicing, by the mechanical contractor. The dry contacts shall close to prove the ion generator is working properly and may be daisy chained in series such that only one dry contact per duct is required to interface to the BAS or the optional DDC controller.

H. Ionization Requirements:

- 1. Plasma Generators with Bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above.
 - a. The Bi-polar ionization system shall consist of Bi-Polar Plasma Generator and power supply. The Bi-polar system shall be installed where indicated on the plans or specified to be installed and powered by 24VAC.
 - b. Ionization Output: The ionization output shall be controlled such that an equal number of positive and negative ions are produced. Imbalanced levels shall not be acceptable.
 - c. Ionization output from each electrode shall be a minimum of 140 million ions/cc (C6.0) and 200 million ions/cc (C10.0) when tested at 1" from the ionization generator.
 - d. All manufacturers shall provide documentation by an independent NELEC accredited laboratory that proves the product has minimum kill rates for the following pathogens given the allotted time and in a space condition:

- A. MRSA - >96% in 30 minutes or less

- B. E.coli - > 99% in 15 minutes or less
 - C. TB - > 69% in 60 minutes or less
 - D. C. diff - >86% in 30 minutes or less
 - 1. Manufacturers not providing the equivalent space kill rates shall not be acceptable. All manufactures requesting prior approval shall provide to the engineer independent test data from a NELEC accredited independent lab confirming kill rates and time meeting the minimum requirements stated in section 2.2 B, points 6A, 6B and 6C. Products tested only on Petri dishes to prove kill rates shall not be acceptable.
 - 2. Ozone Generation:
The operation of the electrodes or Bi-polar ionization units shall conform to UL 867-2007 with respect to ozone generation. There shall be no ozone generation during any operating condition, with or without airflow.
- I. Electrical Requirements:
- 1. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.
- J. Control Requirements:
- 1. All Plasma Generators shall have internal short circuit protection, overload protection, and automatic fault reset.
 - 2. Integral airflow sensing shall modulate the Plasma output as the air flow varies or stops. A mechanical air flow switch shall not be acceptable as a means to activate the Plasma device due to high failure rates and possible pressure reversal.
 - 3. The installing contractor shall mount and wire the Plasma device within the air handling unit specified or as shown on the plans. The contractor shall follow all manufacturer IOM instructions during installation.
 - 4. All Plasma devices shall have a means to interface with the BAS system. Dry contacts shall be provided to prove there are ions being produced. Systems providing indication that power is applied to the Plasma device, but not directly sensing the power at the ion output, shall not be acceptable.
 - 5. Plasma systems that use multiple modules with ion output alarm wires wired to the same terminal such that all ion modules must fail to show an alarm status shall not be acceptable.

PART 3 - EXECUTION

3.01 GENERAL:

- A. The Contractor shall be responsible for maintaining all air systems until the owner accepts the building (Owner Acceptance).

3.02 ASSEMBLY & ERECTION: PLASMA GENERATOR WITH BI-POLAR IONIZATION:

- A. All equipment shall be assembled and installed in a workman like manner to the satisfaction of the owner, architect, and engineer.
- 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 dust and damage on a daily basis throughout construction.

3.03 TESTING:

- A. Provide the manufacturers recommended electrical tests.

3.04 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

SECTION 15760-HEAT PUMP UNITS

PART 1 - GENERAL

1.01 SCOPE:

- A. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS

2.01 HEAT PUMP OUTDOOR UNITS:

- A. Outdoor units: A single or multiple reciprocating compressors, heat transfer coil, fans and inter connecting piping and controls all enclosed in a single casing. For multiple compressor units provide separate refrigerant circuits.
- B. Casings: Designed for outdoor installation, constructed of not lighter than 20 gauge galvanized steel with baked enamel finish over bonderizing. Provide access panels, condenser inlet guards and fan outlet guards.
- C. Compressors: Welded or bolted hermetic, spring isolated, with reversible oil pumps.
- D. Coils: Aluminum fins securely bonded to seamless copper tubes.
- E. Fans: Direct driven propeller fans with weather protection for fan motors.
- F. Provide suction and discharge service valves, liquid stop valve, solenoid change over valves, and expansion valves.
- G. Controls: Factory wired and located in a readily accessible location. Compressor motor shall have line voltage (multi step) contactor and both temperature and current sensitive overload devices. Include high and low pressure switches, crank case heater, defrost thermostat, and defrost timer.
- H. Mount outdoor units on roof on supports or on grade on poured in place pad as shown.
- I. Provide five (5) year non pro rated compressor parts warranty.
- J. Heat pumps: shall be manufactured by Carrier, Trane, JCI or approved equal.

2.02 HEAT PUMP - INDOOR UNITS:

- A. Indoor Units: Supply fans, coils, filters, and drip pans, horizontal or vertical as shown.
- B. Casings: Galvanized steel not lighter than 22 gauge, reinforced with angles or formed shapes with baked enamel finish over bonderizing. Casing panels: Removable for access to fans, motors, coils, and bearings. Provide knockouts for piping and electrical connections. Casing shall be insulated with 1" thick neoprene coated duct liner meeting the requirements of NFPA 90A.
- C. Provide statically and dynamically balanced belt or direct driven centrifugal fans with self aligning ball bearings, adjustable speed motor pulley 3 speed, and

adjustable motor base. Size belt drives for 50% overload. Fan motor and drive shall be located inside unit cabinet. Provide fan starting relay for each unit.

- D. Coils: Include direct expansion coils, expansion valves, and electric heating coils. Refrigerant coils shall consist of non ferrous fins securely bonded to seamless copper tubes, and shall bear ARI approved ratings.
- E. Drain Pans: Provide corrosion resistant coating and insulating corrosion resistant fill.
- F. Filters: 1" thick throwaway filters. Turn equipment over to Owner with clean filters. Provide filter racks with hinged and latched doors.
- G. Electric Heaters:
 - 1. All heaters shall be listed in the Underwriters Laboratories, Inc. Electrical Appliance and Utilization Equipment list.
 - 2. Heaters shall have ceramic supported nichrome wire elements, flanged mounting plate, NEMA I control box containing contactors for heaters, factory wired to terminal strips and 1/2" insulation between mounting plate and control box. All sheet metal parts in air stream aluminized or galvanized steel. Provide spaces at terminal end of heater so that internal duct insulation will not cause hot spots.
 - 3. Equip heaters with factory wired automatic high limit control and a supplementary independent thermal device to disconnect all power circuits in case automatic high limit fails. Equip heaters shall be supplied with control circuits suitable for 24 volt control, factory wired to terminal blocks in control box.
 - 4. Provide staging as required by Code, but no fewer stages than those shown.
- H. Provide insulated plenum bases as shown.
- I. Units shall be UL listed for scheduled voltage.
- J. Heat pumps: shall be manufactured by Carrier, Trane, JCI or approved equal.

2.03 HEAT PUMP - (MINI-SPLIT):

- A. The Heat Pump system shall be a Mitsubishi Electric, Trane, Daikin, Samsung or approved equal split system with Variable Speed Inverter Compressor technology. The system shall consist of a ceiling-suspended or wall mounted indoor section with wired, wall mounted controller and a horizontal discharge, single phase outdoor unit.
- B. Quality Assurance
 - 1. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.
 - 2. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
 - 3. The units shall be rated in accordance with Air-conditioning Refrigeration Institute's (ARI) Standard 210 and bear the ARI Certification label.

4. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
5. A dry air holding charge shall be provided in the indoor section.
6. The outdoor unit shall be pre-charged with R-410a refrigerant.
7. System efficiency shall meet or exceed 13.0 SEER.

C. Delivery, Storage and Handling

1. Unit shall be stored and handled according to the manufacturer's recommendations.
2. The wireless controller shall be shipped inside the carton with the indoor unit and able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.

D. Warranty

1. The units shall have a manufacturer's parts and defects warranty for a period one (1) year from date of installation. The compressor shall have a warranty of 6 years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.
2. Manufacturer shall have over 25 years of continuous experience in the U.S. market.

E. Performance

1. Each system shall perform in accordance to the ratings shown in the table below.
Cooling performance shall be based on 80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) for the indoor unit and 95°F DB, 75°F WB (35°C DB, 29.3°C WB) for the outdoor unit. Heating performance shall be based on 70°F DB, 60°F WB (21.1°C DB, 15.6°C WB) for the indoor unit and 47°F DB, 15°F WB (8.3°C DB, 6.1°C WB) for the outdoor unit.

F. Indoor Unit

1. The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit in conjunction with the wired, wall mounted controller shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from the factory.

2. Unit Cabinet

The casing shall be ABS plastic and have a Munsell 0.70Y 8.59/0.97 finish. Cabinet shall be designed for suspension mounting and horizontal operation. The rear cabinet panel shall have provisions for a field installed filtered outside air intake connection.

3. Fan

The evaporator fan shall have three high performance, double inlet, forward curve sirocco fans driven by a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of four (4) speeds: Low, M1, M2, and Hi.

4. Vane

There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall provide a choice of five (5) vertical airflow patterns selected by remote control: 100% horizontal flow, 80% horizontal flow (plus 20% downward airflow), 60% horizontal airflow (plus 40% downward airflow), 40% horizontal airflow (plus 60% downward airflow), and swing. The horizontal vane shall significantly decrease downward air resistance for lower noise levels, and shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to provide horizontal swing airflow movement selected by remote control.

5. Filter

Return air shall be filtered by means of an easily removable washable filter.

6. Coil

The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil.

7. Electrical

The electrical power of the unit shall be 208 volts or 230 volts, 1 phase, 60 hertz. The system shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts. The power to the indoor unit shall have an option of being supplied from the outdoor unit, using Mitsubishi Electric A-Control system or separate power source for indoor and outdoor units.

8. Control

- a. The control system shall consist of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. Field wiring shall run directly from the indoor unit to the wall mounted controller with no splices.
- b. For A-Control, a three (3) conductor 14 ga. AWG wire with ground shall provide power feed and bi-directional control transmission between the outdoor and indoor units.
- c. Where separate power is supplied to the indoor and outdoor units, a two (2) 20 ga. AWG wire shall be run between the units to provide forbid-directional control communication..
- d. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the wired controller panel.
- e. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from the wired controller, providing emergency operation and controlling the outdoor unit.
- f. The indoor unit shall be connected to a wall mounted wired controller to perform input functions necessary to operate the system. The wired controller shall have a large multi-language DOT liquid crystal display (LCD) presenting contents in eight (8) different languages, including English, French, Chinese, German, Japanese, Spanish, Russian, and Italian.
- g. There shall be a built-in weekly timer with up to eight pattern settings per day. The controller shall consist of an On/Off button, Increase/Decrease Set Temperature buttons, a Cool/Dry/Fan mode selector, a Timer Menu button, a Timer On/Off button, Set Time buttons, a Fan Speed selector, a Vane Position selector, a Louver Swing button, a Ventilation button, a Test Run button, and a Check Mode button. The controller shall have a built-in temperature sensor. Temperature shall be displayed in either Fahrenheit (°F) or Celsius (°C). Temperature changes shall be by increments of 1°F (1°C) with a range of 67°F to 87°F (19°C to 30°C).
- h. The wired controller shall display operating conditions such as set temperature, room temperature, pipe temperatures (i.e. liquid, discharge, indoor and outdoor), compressor operating conditions (including running current, frequency, input voltage, On/Off status and operating time), LEV opening pulses, sub

cooling and discharge super heat.

- i. Normal operation of the wired controller shall provide individual system control in which one wired controller and one indoor unit are installed in the same room. The controller shall have the capability of controlling up to a maximum of sixteen systems at a maximum developed control cable distance of 1,500 feet (500 meters).
- j. The control voltage from the wired controller to the indoor unit shall be 12 volts, DC. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Up to two wired controllers shall be able to be used to control one unit.
- k. Control system shall control the continued operation of the air sweep louvers, as well as provide On/Off and mode switching. The controller shall have the capability to provide sequential starting with up to fifty seconds delay.

G. Outdoor Unit

- 1. The outdoor unit shall be compatible with the three different types of indoor units (PKA - wall mounted, PCA - ceiling suspending, and PLA - four way ceiling cassette). The connected indoor unit must be of the same capacity as the outdoor unit.
- 2. Models PUY-A24NHA and PUY-A36NHA shall have the option to connect to two indoor units, within the same confined space, to improve air distribution (total capacity shall be equivalent to outdoor unit).
- 3. The outdoor unit shall be equipped with a control board that interfaces with the indoor unit to perform all necessary operation functions.
- 4. The outdoor unit shall be capable of operating at 0°F (-18°C) ambient temperature without additional low ambient controls (optional wind baffle may be required).
- 5. The outdoor unit shall be able to operate with a maximum height difference of 100 feet (30 meters) between indoor and outdoor units.
- 6. System shall have a maximum refrigerant tubing length of 165 feet (50 meters) between indoor and outdoor units without the need for line size changes, traps or additional oil.
- 7. Models PUZ-A24NHA, PUZ-A30NHA and PUZ-A36NHA shall be pre-charged for a maximum of 70 feet (20 meters) of refrigerant tubing. Model PUZ-A42NHA shall be pre-charged for a maximum of 100 feet (30 meters) of refrigerant tubing. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.

8. Cabinet

The casing shall be constructed from galvanized steel plate, coated with a finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection and have a munsell 3Y 7.8/1.1 finish. The fan grille shall be of ABS plastic.

9. Fan

Models PUZ-A24NHA, PUZ-A30NHA, and PUZ-A36NHA shall be furnished with an AC fan motor. Model PUZ-A42NHA shall have two (2) DC fan motors. The fan motor shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent contact with moving parts.

10. Coil

The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up. The coil shall be protected with an integral metal guard. Refrigerant flow from the condenser shall be controlled by means of linear expansion valve (LEV) metering orifice. The LEV shall be control by a microprocessor controlled step motor.

11. Compressor

The compressor for models PUY-A24NHA, PUY-A30NHA and PUY-A36NHA shall be a DC rotary compressor with Variable Compressor Speed Inverter Technology. The compressor for model PUY-A42NHA shall be a scroll compressor with variable speed technology. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which results in vast energy savings. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be intermittently applied to the compressor motor to maintain enough heat. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

12. Electrical

The electrical power of the unit shall be 208volts or 230 volts, 1 phase, 60 hertz. The unit shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts. The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC. The unit shall have Pulse Amplitude

Modulation circuit to utilize 98% of input power supply.

PART 3 – EXECUTION

3.01 INSTALLATION:

- A. Heat pumps shall be installed in accordance with manufacturer's recommendations.
- B. See details for mounting instructions and accessories.
- C. Guarantees, Tests and Training:
 - 1. Efficiency Guarantee: The complete unit guaranteed to operate at the scheduled efficiency or greater over the operating range.
 - 2. Field Training for Owner's Technician - Professional training and certification for operation and maintenance of product to insure proper function and extended life.
- D. Starting Service: After installation is completed, provide a field representative for starting the unit(s) and training the operator. This service not to exceed four (4) consecutive days.

END OF SECTION

SECTION 15820 – FANS

PART 1 - GENERAL

1.01 SCOPE

- A. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS

2.01 FANS, CENTRIFUGAL IN-LINE:

- A. AMCA approved air and sound rated direct (or) belt driven fans (as scheduled) complete with V-belt drive sized for 50% overload, self aligning grease lubricated ball bearings, adjustable pitch motor pulleys, adjustable motor bases and statically and dynamically balanced backward curved blade wheels, all enclosed in a galvanized steel housing with inlet bell and outlet duct collars. (Fan wheel and motor assembly shall be hinged for access.)
- B. Fans shall be manufactured by Greenheck, Cook, Acme, Twin City or approved equal.

2.02 FANS, CENTRIFUGAL CEILING EXHAUST

- A. AMCA rated direct drive centrifugal fans for ceiling mounting, complete with removable ceiling grille, disconnect, fan mounted solid state speed control, flexible duct connection, integral backdraft damper and discharge outlet.
- B. Fans shall be manufactured by Greenheck, Cook, Acme, Penn, Twin City, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Fans shall be installed in accordance with manufacturer's recommendations.
- B. See details for mounting instructions and accessories.

END OF SECTION 15820

SECTION 15840 - DUCTWORKPART 1 - GENERAL1.01 SCOPE

- A. Include Section 15010, "GENERAL PROVISIONS - HVAC", with this section.
- B. Provisions of this Section shall apply to all HVAC work.

1.02 SHOP DRAWINGS:

- A. Ductwork shop drawings shall include details of duct constructions: seams, joints, gauges, reinforcing and hanger details for each pressure class and size range together with details of turning vanes, branch connections, dampers and access doors and elevations of all ductwork.

PART 2 - PRODUCTS2.01 DUCTWORK - GENERAL:

- A. Unless otherwise shown or specified construct ducts of galvanized steel sheet metal using gauges and recommended details as contained in the current edition of the SMACNA HVAC Duct Construction Standards. Ductwork shall include supply air, exhaust air, return air, and outdoor air ducts, together with all necessary fittings, splitters, dampers, quadrants, flexible connections, sleeves, hangers, support, braces, etc. Hang and install ducts in a neat and workmanlike manner from structural members (not roof deck) with adequate bracing and cross bracing to prevent breathing, rattling, and vibration.
- B. No flexible ductwork on return, exhaust or outside air.
- C. Install Duro-Dyne locking quadrants and Duro-Dyne end bearings on all splitters and manual volume dampers located above accessible ceiling and Young #1 regulator, C.P., and Duro-Dyne end bearings elsewhere.
- D. Duct dimensions shown do not include allowance for internal insulation.
- E. Duct Turns: Wherever possible, duct turns shall have a centerline radius equal to 1.5 times the duct width in the plane of the turn. Vane other duct turns to provide a dynamic loss coefficient ("C") not greater than 0.2. No reducing ells or tees to be used.
- F. Duct Sealing: Seal duct seams and joints as noted below. Seal entire circumference of all branch duct connections, tapping collars and spin-ins. Seal ducts using mastic sealant equal to United Duct Sealer.
 - 1. Class "A" Seal: Seal all joints and seams and leak test as specified.
 - 2. Class "B" Seal: Seal entire circumference of all transverse joints, seal all longitudinal joints.
 - 3. Class "C" Seal: Seal entire circumference of all transverse joints.
 - 4. Class "D" Seal: Seal corner of transverse joints.

2.02 DUCTWORK - LOW PRESSURE:

- A. Ductwork: Low Pressure, Pressure and Seal Class shall include:
 - 1. All supply air ductwork: 2" pressure, class "B" seal.
 - 2. All return air ductwork: 2" pressure, class "B" seal.
 - 3. All outside air ductwork: 2" pressure, class "B" seal.
 - 4. General exhaust air ductwork: 2" pressure, class "B" seal.
- B. Construct ducts in accordance with SMACNA Duct Construction Standards for pressure and seal classes noted.

2.03 FLEXIBLE DUCTS:

- A. Flexible duct connectors: A two (2) element spiral construction composed of galvanized steel supporting spiral and coated woven textile fabric with metal or mineral base, UL listed as Class I Air Duct and Connector (UL 181) minimum R=6.0.
- B. Flexible connectors shall not exceed 5 feet in length.
- C. Make connections between flexible ducts and other equipment using galvanized steel draw bands with plated screws and buckles and United Duct seal for high and medium pressure ducts and nylon draw bands for low pressure ducts.
- D. Factory insulate cold flexible ducts using insulation equivalent to that specified for cold ducts.
- E. Flexible ducts: Thermoflex M-KC, Wiremold 57K, Technaflex 57K, or Flexmaster Type 4M. Submit sample for approval of any other manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Ductwork shall be installed in accordance with manufacturer's recommendations.
- B. See details for mounting instructions and accessories.

END OF SECTION 15840

SECTION 15860 - DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE

- A. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS

2.01 SHEET METAL SPECIALTIES:

- A. Make rectangular take-offs in low pressure supply, return and exhaust ducts using 45 degrees entry tap (SMACNA Duct Construction Standards Figure #2-8) with manual damper with end bearings and locking quadrant in branch. End bearings and quadrants shall have air tight duct connections and shaft seals: Ruskin, Duro-Dyne, or approved equal.
- B. Manual balancing dampers: Comply with SMACNA Duct Construction Standards, Figure 2-14 and 2-15. Equip all dampers with locking quadrants and end bearings. End bearings and quadrants shall have air tight duct connections and shaft seal, Ruskin, Duro-Dyne, or approved equal.
- C. When damper quadrants are located other than above lay-in ceilings.
 - 1. Provide all necessary accessories for remote control of balancing dampers without requiring access doors. Substitute Young #1 regulators and an additional end bearing or Ventlock #688 regulators and an additional end bearing for the quadrant (regulators shall be chrome plated), or, Architect/Engineer option.
 - 2. Provide access door for access to the quadrant (See sub-section 2.05 "ACCESS DOORS", hereinafter).
- D. Provide "Stand-Offs" (hat sections) for damper quadrants, controls, etc., on externally insulated ducts.
- E. Branch duct connections for connecting round low pressure branches to rectangular low pressure trunks: spin-in fittings with integral dampers with end bearings, stand-off and beaded collars. Seal Class of components penetrating duct shall be consistent with duct pressure class. Spin-in shall be Flexmaster - FLD. Submit sample for approval of other manufacturers for prior approval.

2.02 FIRE DAMPERS:

- A. Install UL labeled 1-1/2 hour fire dampers wherever sheet metal ducts pass through chase walls, floors, outside fire chases, and elsewhere as shown or required by local Code. Install dampers per SMACNA "Fire Damper Guide" and UL 555.
 - 1. Fire dampers shall be Type "B" "Venation Blind" dampers. Unless otherwise shown folded blades shall not obstruct duct. Dampers in floors shall be spring loaded.
 - 2. Provide factory fabricated steel integral wall sleeve 3" longer than wall

thickness for each fire damper and install sleeve using bolts and angles as detailed in Figure #1 of SMACNA "Fire Damper Guide".

3. Provide rectangular, round and/or flat-oval collars. See Drawings for sizes and locations.
 4. For aluminum ductwork provide stainless steel fire dampers.
- B. Install ceiling fire dampers in all fire rated ceiling as shown in Figure #11 of SMACNA "Fire Damper Guide" at ceiling penetrations as noted. Fire rated diffuser assembly to be approved for the specific UL Classification of the ceiling assembly used.
- C. Install access door in low pressure ducts at each fire damper. Install wall or ceiling access door for access to fire dampers not accessible through lift-out ceilings. See sub-section 2.05 "ACCESS DOORS", below.
- D. Install three (3) hour fire dampers where sheet metal ducts pierce 4 hour fire walls. Three (3) hour fire damper shall consist of a three (3) hour UL labeled fire door pivoted in a 3" X 3" X 1/4" angle frame bolted through wall. Equip door frame with angle flange and latch. Install Fire Door as shown in Figure 25 and 26 of SMACNA "Fire Damper Guide".

2.03 AUTOMATIC DAMPERS:

- A. Factory fabricated dampers with extruded aluminum airfoil blades and frame with full gasket stops for blades ends. Equip blades with air tight plastic or butyl rubber seals and bronze or nylon bearings. Provide jamb seals. Damper widths from 12" to 60" wide shall not leak any greater than 8 cfm sq. ft. at 4" w.g. and a maximum of 3 CFM sq. ft. at 1" w.g. Ruskin CD50 or approved equal.
- B. Automatic dampers located near fan outlets or in ducts having maximum velocities exceeding 1500 FPM shall have extruded aluminum air-foil blades and all linkages shall be located outside of airstream. Such dampers shall have leakage rates not exceeding 1% maximum design flow at 4" WG pressure differential.

2.04 SMOKE DETECTORS:

- A. Smoke detectors shall be ionization detectors which detect product of combustion. Furnish, wire, and install smoke detectors under this Section. Provide remote visual/audio indicator mounted on the ceiling near the detector.
- B. Locate smoke detectors so that indicating lights are visible and so that they will not be affected by moisture from coils or humidifiers.

2.05 ACCESS DOORS:

- B. Access doors in low pressure ducts: Galvanized steel frame with gasket permanently secured to duct with a removable gasket access port held in place with screw driver or thumb operated latches. Door in insulated ducts: Double thickness with insulation. Doors in non-insulated ducts: A single thickness. Weld door frames to kitchen exhaust ducts. Size doors to permit removal of equipment or maintenance. Minimum size 12" X 12".
- E. Mark access points in lift-out ceilings with brass paper brads. Bend points of brads over top of ceiling.

2.06 FLEXIBLE DUCT CONNECTIONS:

- A. Install Neoprene coated glass cloth flexible connections at all duct connections to all fans and AC Units.
- B. Install flexible connections in all ducts at building expansion joints.

2.07 ELECTRICAL GROUNDING:

- A. Ground all fans.
- B. Install braided copper jumpers around all flexible connections, taking care that jumpers do not bind flexes.

2.08 INTAKE AND RELIEF ROOF HOOD:

- A. Factory fabricated spun aluminum ventilator with integral curb cap and birdscreen. Equip hood with galvanized steel curb with wood nailer. Minimum material gauges, hood 20 gauge, base 18 gauge, curb 18 gauge.
- B. Gravity Roof Ventilators shall be manufactured by Greenheck, Cook or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Duct shall be installed in accordance with SMACNA Standards.
- B. Equipment shall be installed in accordance with manufacturer's recommendations.
- C. See details for mounting instructions and accessories.

END OF SECTION 15860

SECTION 15870 - OUTLETSPART 1 - GENERAL1.01 SCOPE

- A. Include section 15010 "GENERAL PROVISIONS" with this section.
- B. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS2.01 GRILLES, REGISTERS AND DIFFUSERS:

- A. General: Air devices may be Titus, Price, Nailor, Krueger, or approved equal. Where fire dampers are required at grilles, provide steel grilles, not aluminum.
- B. Architectural Supply Diffuser (S): The diffuser shall have an 18 gauge steel face panel, which shall be a one piece assembly, removable by means of four positive locking posts. The exposed surface of the face panel shall be smooth, flat, and free of visible fasteners. The face panel shall project 1/4" below the outside border of the diffuser back pan. The back of the face panel shall have an aerodynamically shaped, rolled edge to ensure a tight horizontal discharge pattern. The back pan shall be one piece precision die-stamped and shall include an integrally drawn inlet. The diffuser back pan shall be constructed of 22 gauge steel. The finish shall be #26 white. The pencil hardness must be HB to H. Provide round damper constructed of heavy gauge steel. Damper must be operable from the face of the diffuser. Option AL downblow clips shall be provided to restrict the discharge air in certain directions. The manufacturer shall provide published performance data for the square panel diffuser. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991. Diffuser shall be Titus "OMNI".
- C. Supply Registers (SR): Adjustable vertical deflection, adjustable horizontal deflection, removable core, opposed blade damper and multi-blade scoop and off white baked enamel finish. Titus "272FS".
- D. Bar Return Grille (BRG): All steel, heavy duty, 16 gauge border, 14 gauge blades, 1/2" spacing, 38° deflection. Provide all frames. Titus "33R".
- E. Wall Return Grilles (WRG): Horizontal bars fixed at about 15° angle, close spacing and plaster frames. Off white baked enamel finish. Titus "350FL".
- F. Wall Return Register (WRR): Horizontal bars fixed at about 15° angle, plaster frames and opposed blade damper. Off white baked enamel finish. Titus "350FL".
- G. Ceiling Return Grilles (R), Ceiling Exhaust Grilles (E) and Transfer Air Grilles (T): All aluminum, 1/2" X 1/2" X 1/2" cube core and plaster frames as needed. Off-white baked enamel finish. Provide 24 x 24 panel so grille will fit in 24 x 24 ceiling grid. Titus "50F".

2.02 WEATHER LOUVERS:

- A. Louvers shall be 6" thick extruded aluminum louvers with 12 gauge blades with drainable head frame, drainable blades, water stop, and with angled sill. 57% F.A. minimum. Equip with 1/2" mesh aluminum birdscreen on inside of louver. Finishes: Kynar. Submit color sample to Architect (20 year warranty on finish). Ruskin ELF6375DX, Louvers &

Dampers, Greenheck, Airolite, or approved equal.

3.00 EXECUTION:

3.01 INSTALLATION:

- A. Equipment shall be installed in accordance with SMACNA Standards and manufacturer's recommendations.
- B. See details for mounting instructions and accessories.
- C. Secure louver to structure to comply with FEMA 361 and the following:
 - 1. Substrate: CMU, Grout filled.1500 Min. PSI
 - a. Anchor Type: 3/4 inch (19 mm) diameter Hilti HIT HY 150 x 8 in (203) long threaded adhesive anchor.
 - b. Embedment: 6-3/4 inches (172 mm) minimum.
 - c. Factory Attachment Angle secured at factory.
 - d. Shipped Loose Attachment Angle: 4 in x 6 in x 20 in long (102 x 152 x 508) A36 HDG angle. 1/2 in (13) thick.
 - 2. Substrate: Concrete 2500 PSI Minimum Compression Strength.
 - a. Anchor Type: Hilti Kwik Bolt TZ CS III 1/2 (6) diameter x 3-3/4 in (95) long
 - b. Embedment: 3-1/2 inches (89 mm) minimum.
 - c. Factory Attachment Angle secured at factory.
 - 3. Substrate: Steel Framing.
 - a. Factory Attachment Angle secured at factory.

END OF SECTION

FILTERS – HVAC - SECTION 15880

1.00 GENERAL:

1.01 SCOPE:

- A. Provisions of this section apply to all HVAC work.

2.00 PRODUCTS:

2.01 FILTERS - AIR:

- A. 30% Filters, 1" or 2" Thick (Maximum allowed by MFR): Throwaway deep pleated filters, maximum face velocity 350 fpm. Maximum initial pressure drop 0.1" WG, UL Class 1, 30% efficiency per ASHRAE Test Standard 52-76, minimum ratio of media area to face area 4.4:1. Turn system over to Owner with clean filters and provide one (1) set of spare filters. Farr 30/30 or approved equal.

3.00 EXECUTION:

3.01 INSTALLATION:

- A. Filters shall be installed in accordance with manufacturer's recommendations.
- B. See details for mounting instructions and accessories.

END OF SECTION

SECTION 15900 - CONTROLS

PART 1 - GENERAL

1.01 SCOPE

- A. Include Section 15010 "GENERAL PROVISIONS", with this Section.
- B. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS

2.01 CONTROL SYSTEMS

- A. Furnish and install complete and ready for operation with control sequences specified below.
- B. Products of a manufacturer maintaining complete service and parts facilities in Alabama continuously for the last three (3) years: Trane, Carrier, Johnson Controls, or approved equal.
- C. Control equipment, except for items comprising an integral part of the water or refrigeration piping, shall be installed by trained mechanics employed by the Control Manufacturer.
- D. Include the services of a full time control technician for calibrating and adjusting controls for the first 5 working days after Owner has occupied building.
- E. Before installation, submit for approval five (5) copies of complete power and control wiring and piping diagrams.
- F. Provide permanent nameplates for control switches and motor starters. Nameplates: engraved laminated plastic with letters legible under normal operating conditions. (White on black).
- G. Permanently identify control devices other than room thermostats, so they may be identified on control diagrams. Provide engraved plastic nameplates for items mounted outside of or on faces of panels. Mark other instruments with indelible ink.
- H. At controls contractor option, system may be wireless communication.

2.02 CONTROL WIRING:

- A. Include control and interlock wiring and power wiring for control panel in this Section. Install in conduit in accordance with provisions of Electrical Work where exposed, concealed in walls or above ceilings other than lay-in type. Provide plenum rated cable above lay-in ceilings (for plenum or non-plenum).
- B. Waterproof and firestop all conduit floor penetrations. Firestop conduit penetrations of fire rated walls partitions.
- C. Wire all devices individually to terminal strips in control panels.
- D. Furnish necessary relays and auxiliary contactors and other accessories required.

Provide interlock relays per NEC. Coordinate start-stop stations, auxiliary contacts, etc., with supplier of Starters, Variable Frequency Drive (VFD) and Motors Control Centers specified in Electrical Work.

2.03 CONTROL DEVICES:

- A. Room Thermostats: (Provide seven (7) day occupied/unoccupied, 24 hour, multi-stage programmable thermostats, with 3-hour override, and battery back-up. Thermostats to be provided with local control. Thermostat covers: lockable high impact plastic. Mount room thermostats with tops 4 feet above floors.
- B. Remote Bulb Thermostats (DDC) and Temperature Transmitters (DDC): Unless otherwise shown use averaging elements not less than 12 feet long for duct or casing cross sections for each 24 square feet of face area.
- C. Thermometers: Pipe line thermometers are specified in another Section. Install digital readout thermometers in ducts where shown on control diagrams, providing averaging bulbs where shown and/or required.
- D. Freezestats: Manual reset, pneumatic not permitted. Locate freezestat bulbs between preheat and chilled water coils in units with chilled water coils and downstream from DX coils in units with DX coils. Provide coverage for each 3' X 3' coil face area section.
- E. Firestats: Single pole double throw, electric, manual reset, pneumatic not permitted. Firestats shown to be connected to the fire alarm system: compatible with fire alarm system, furnished and installed under Controls, wired under Electrical Work. Firestats to be installed in all fans where smoke detectors are not furnished.
- F. Program Clocks / Timers:
Provide digital time clock with 365 day holiday capabilities with 24 single dates, 99 setpoints, separate scheduling for each day of the week, AM/PM format, one minute programming resolution, portable memory module, optional programmer for integration into a Windows based PC for program duplication and modifications, LCD display, daylight savings or standard time, automatic leap year correction, permanent schedule retention, 100 hours of backup, manual override, Nema 3 indoor/outdoor enclosure. Clock/Timer to be Tork or approved equal.
- G. Valve and Damper Operators: Of sufficient power to close/open valves and dampers under operating conditions. Electric valve and damper motors shall have oil immersed gear trains and spring return to normal position.
- H. Wells: Install pipe line mounted control and indicating devices in stainless steel or brass thermometer wells.
- I. Capillary Supports: Securely support all duct-mounted and casing- mounting thermostat capillaries using factory fabricated copper bulb supports.
- J. Provide stand-offs for control devices mounted on externally insulated ducts and equipment.
- K. Anchor all items mounted on gypsum board (dry-wall) using toggle bolts or moly bolts, not expansion shields.

2.04 CONTROL POWER:

- A. All 120 Volt wiring shall be the responsibility of the Control Sub-Contractor from circuit furnished under Electrical Section. Coordinate circuit locations with General and Electrical Contractors.
- B. Power wiring to all automatic dampers shall be included under this section.
- C. Wiring and relays between light and fans for interlock shall be included under this section.

2.05 CONTROL SEQUENCES:

- A. As shown on Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Control diagrams on drawings and/or Control Sequences are intended to indicate, in general, control arrangements. Provide all instruments, relays, operators, switches, etc. required to accomplish control sequences whether or not such devices are actually shown.

END OF SECTION 15900

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Project: Senior Wellness Center, Gadsden AL
Architect: Thomas M. McElrath, Architect
EE Group. Project Number: 4800-22

DIVISION	SECTION TITLE
26 01 01	BASIC ELECTRICAL REQUIREMENTS
26 05 19	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 05 26	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 05 29	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
26 05 33	RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
26 05 44	SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
26 05 53	IDENTIFICATION FOR ELECTRICAL SYSTEMS
26 05 73	ELECTRICAL SYSTEM STUDIES
26 09 23	LIGHTING CONTROL DEVICES
26 09 25	LIGHTING CONTROL SYSTEM
26 24 16	PANELBOARDS
26 27 26	WIRING DEVICES
26 28 16	ENCLOSED SWITCHES AND CIRCUIT BREAKERS
26 43 13	SURGE PROTECTION FOR LOW VOLTAGE ELECTRICAL POWER CIRCUITS
26 51 00	INTERIOR LIGHTING
26 56 00	EXTERIOR LIGHTING
26 65 20	DIGITAL ADDRESSABLE FIRE ALARM SYSTEM
26 65 20A	APPENDIX – FIRE ALARM CONTRACTOR QUALIFICATIONS
26 80 00	ACCESS CONTROL SYSTEM
26 90 00	STRUCTURED CABLING SYSTEM

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PART 1 - GENERAL REQUIREMENTS

1.1 RELATED DOCUMENTS

- A. The following codes and standards are referenced in this document.
 - 1. NFPA 70, National Electrical Code, 2017
 - 2. ASHRAE 90.1, Energy Standard for Buildings, 2013
 - 3. International Fire Code (IFC) 2015
 - 4. International Building Code (IBC) 2015
 - 5. Americans with Disabilities Act Accessibility Guidelines (ADAAG) 2010
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SCOPE OF WORK

- A. Arrange with the local utility companies for providing such electrical services as shown on drawings or herein specified. Coordinate all requirements for the electrical services shown on the plans with the utility engineering and construction supervisors prior to bidding and/or roughing. NOTIFY ENGINEER IN WRITING OF DISCREPANCIES BETWEEN PLANS AND UTILITY REQUIREMENTS FOR RESOLUTION PRIOR TO BIDDING.
- B. All aid to construction charges for permanent power to be paid direct by owner. All aid to construction charges for temporary power to be included in bid price and to be paid by contractor.
- C. Remove or relocate all electrical services located on or crossing through the Project property, either above or below grade, which would obstruct the construction of the Project or conflict in any manner with the completed Project or any Code pertaining thereto. See Civil Engineering Plans in addition to electrical site plan for work required. Although the design team has made every effort to correctly represent existing conditions on site, it is the contractor's responsibility to visit the site and determine the extent of the required demolition and new electrical work.
- D. Furnish and install complete temporary electrical light and power system during construction period. The required temporary lighting required during finish work shall be sufficient so as to facilitate other trades (finishes). Coordinate lighting requirements where interior finishes are being applied with the general contractor and/or painting subcontractor.
- E. Furnish and install complete electrical light and power systems.
- F. Connect all meters, panelboards, circuit breakers, power outlets, convenience outlets, switches and/or other equipment forming part of the system.
- G. Furnish and install complete system of outlet boxes, faceplates, conduit raceways, cables and terminal cabinets for IT and security systems system.
- H. Connect all electrical equipment noted in this Section or noted on Drawings, whether furnished by Electrical Contractor or by others.
- I. The electrical contractor shall review all sections of the contract documents (Plans and Specifications) and shall endeavor to determine all equipment requiring electrical power whether shown on the electrical plans or not. Notify the Electrical Engineer in

writing prior to the bid with any discrepancies with mechanical and/or plumbing plans. Include in bid price all required materials and labor required for a full functioning system/building.

- J. Connect all mechanical and plumbing equipment as required to provide a full functioning system as specified by the Mechanical Engineer. Verify locations for all dampers (control dampers and fire/smoke dampers), circulating pumps, fans, boilers, water heaters and other loads with the mechanical and plumbing plans prior to bidding.
- K. Install all starters as shown on plans or as called for in these Specifications. All starters shall be NEMA rated. All VF drives for mechanical equipment shall be furnished and installed by mechanical contractor with power feeder and final connections to the VF drive by the electrical contractor.
- L. Furnish and install all disconnect switches.
- M. Furnish and install power wiring and connection for starters and motors. Furnish and install all control wiring specifically shown on drawings or as required to make the system operational as designed.
- N. Furnish and install generator set and transfer switch as shown on the plans. Provide and install control wiring, annunciators, connections, testing and startup for complete system.
- O. Provide and install lighting control system for Bunk, Apparatus Room, Day room, entryway and secure corridor lighting as shown on the plans. Provide and install interface with alarm system to automatically turn lights ON to full bright in Bunks, Secure Corridor and Apparatus Room Lights. Provide and install dimming controls in bunk rooms as shown. Provide astronomic timeclock control for entryway lighting. Provide and install occupancy sensing with manual overrides for Secure Corridor. Provide manual, non-dimmed control of apparatus room lights.
- P. Furnish and install Auxiliary Systems as shown on the Drawings and as required.
- Q. Procure and pay for permits and certificates as required by local and state ordinances and Fire Underwriters Certificate of Inspection.
- R. Submit to Architect, a certificate of Final Inspection from local inspection department.
- S. Work noted "NIC" (Not in Contract) shall be excluded from the work to be done by this trade, as follows:
 - 1. A complete System of Control Wiring for the Mechanical System (unless specifically shown on Drawings).
 - 2. Motors in place by others, connection for correct rotation by this trade.
- T. Division 26 will be responsible to support the commissioning requirements specified in section 01 91 13 and other sections referenced in 01 91 13.

1.3 DRAWINGS AND SPECIFICATIONS

- A. Electrical work shown on drawings inclusive. Follow any supplementary drawings as though listed above.
- B. Drawings and Specifications are complementary. Work called for by one is binding as if called for by both.

- C. Drawings show general run of circuits and approximate location of equipment. Right is reserved to change location of equipment and devices and routing of conduits to a reasonable extent, without extra cost to Owner.
- D. Refer conflicts between drawings and specifications describing electrical work and work under other Sections to Architect for remedial action.
- E. Use dimensions in figures in preference to scaled dimensions. Do not scale drawings for exact sizes or locations.
- F. Execution of Contract is evidence that Contractor has examined all drawings and specifications related to work, and is informed to extent and character of work. Later claims for labor and materials required due to difficulties encountered, which should have been foreseen had examination been made, will not be recognized.

1.4 PROJECT COORDINATION MEETINGS

- A. Promptly after award of the Contract, and prior to commencing any project related activities. The Successful Electrical Contractor shall contact the Electrical Engineer to schedule an acceptable date and time for the initial project coordination meeting. This meeting will be held at the Electrical Engineer's office at the scheduled time to discuss any/all issues related to the electrical aspects of the Project. The Contractor, as well as the contractor's job foreman/superintendent for the project is required to attend this meeting. The contractor shall furnish a complete set of Plans and Specifications at this meeting.

1.5 EXISTING CONDITIONS

- A. The Contractor shall visit the site and determine all conditions that affect this Contract. Contractor shall include in bid price cost of relocating any electrical or auxiliary lines and/or equipment as required whether shown or not. Failure to do so will not relieve Contractor of his/her responsibility under this contract.

1.6 TEMPORARY SYSTEMS

- A. The Contractor shall be responsible for the furnishing and installation of all equipment and materials necessary for providing electrical power and lighting to the new building during construction. All temporary wiring shall be made in a safe and approved manner.
- B. It shall be the responsibility of the electrical contractor to visit the site prior to submitting bid and thoroughly review all existing conditions affecting the temporary systems requirements.
- C. The contractor shall provide temporary lighting levels as necessary where interior finishes are being applied. Coordinate with general contractor for required lighting.

1.7 CONTRACTOR QUALIFICATIONS

- A. If the electrical contractor proposes to use any other subcontractor for the installation of any auxiliary system, etc., these Subcontractors shall be a factory authorized distributor of the specified system and shall also meet the above qualifications before bid is acceptable.
- B. All electrical contractors whose submitting bids for this project shall be licensed as an electrical sub-contractor in accordance with the State of Alabama Licensing Board for General Contractors.

- C. The Electrical Contractor shall be properly licensed (before the bid date) to bid and perform the project. This includes being a properly licensed general Contractor in the State of Alabama, such as having a State of Alabama General contractors License with the Major Classifications "Building Construction" (BC) and "Municipal & Utility" (MU), or a General Contractors License in "Specialty Construction" – Electrical (E), as applicable
- D. The Electrical Contractor shall use properly licensed journeymen, and apprentices that are professional craftsmen in the applicable field and provide documentation.
- E. The Electrical Contractor shall possess and provide proof of insurance with coverage and limits meeting or exceeding those prescribed under the laws of the State of Alabama for Liability and Workers' Compensation.
- F. The Electrical Contractor and his/her sub-contractors shall have been in business (under the same name and principal control) for five (5) years prior to date of opening bids and shall have past experience in the types of work involved in this project, and be regularly engaged in all the applicable types of work. Documentation shall be provided on past projects with references for at least five projects or similar type, size and scope.
- G. If the electrical contractor proposes to use any other subcontractor for the installation of any auxiliary system, etc., these Subcontractors shall be a factory-authorized distributor of the specified system and shall also meet the above qualifications before bid is acceptable.
- H. The Electrical Contractor shall use State of Alabama licensed masters and journeymen electricians as job superintendents. The Electrical Contractors superintendent (Journeyman or Master Electrician) shall be on site when electrical work is being performed. The Electrical Contractor shall have on Journeyman or Master Electrical on site for every eight (8) apprentices.

1.8 QUALITY ASSURANCE

- A. All work shall be in accordance with the NFPA 70 National Electrical Code NEC 2017 and the rules and regulations of the local bodies having jurisdiction.
- B. The published standards and requirements of the National Electrical Manufacturers Association, the American National Standard Institute, the Institute of Electrical and Electronic Engineers, and the American Society of Testing Materials, are made a part of these specifications and shall apply wherever applicable.
- C. Work under this Section shall be first class with emphasis on neatness and workmanship.
- D. Install work using competent mechanics under supervision of foreman, all duly certified by local authorities. Installation subject to Architect's constant observation, final approval, and acceptance. Architect may reject unsuitable work.
- E. Furnish Architect written guarantee, stating that if workmanship and/or material executed under this Section is proven to be defective within one (1) year after final acceptance, such defects and other work damaged will be repaired and/or replaced.
- F. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

1.9 ON-SITE OBSERVATIONS AND DEMONSTRATION OF FUNCTIONALITY

- A. Contractor shall notify Engineer at least three (3) days prior to covering any underground feeders, pouring slab, installing ceiling systems in order to allow time for on-site observations.
- B. At all observations of work, open panel covers, junction box covers, pull box covers, device covers, and other equipment with removable plates for check. Provide sufficient personnel to expedite cover removal and replacement.
- C. Contractor to assist Architect in demonstration of operation of new systems to satisfaction of Owner. Contractor to have manufacturer available for demonstration of systems where requested by Owner or as called for in other sections of this specification. Contractor shall notify Engineer and Architect two (2) weeks prior to demonstration of systems where manufacturer assistance is required.
- D. Perform test required by Architect to indicate compliance with specifications, drawings and applicable codes. Provide instruments, labor and materials for tests.

1.10 PROTECTION OF PERSONS AND PROPERTY DURING CONSTRUCTION

- A. Take all precautions to provide safety and protection to persons and protection of materials and property as necessary, including protection from injury from rotating or moving equipment, tools, hot surfaces, holes, shafts, falling objects, electrical energy and all other potential hazards. Erect sign, barricades, warning lights, instruct workmen and others who may be subject to construction hazards.
- B. Protect items of equipment from stain, corrosion, scratches and any other damage or dirt, whether in storage at job site or installed. No damaged or dirty equipment, lenses or reflectors will be accepted.

1.11 CLEARANCE WITH UTILITIES

- A. Before submitting a proposal, check with all authorities or utilities concerned as to points of connection with power and telephone lines, installation of transformers, location of service cut-in and metering, requirements as to any additional service equipment, and other details of the installation. If their requirements are at variance with these specifications or drawings and involve extra expense, these requirements shall be included in bid and the contract price shall include all costs necessary to meet those requirements without extra cost to the Owner after a contract is entered into.

1.12 CHANGES ORDERS AND ADDITIONAL WORK

- A. No change shall be made from the work as called for by these specifications and drawings except on written order of the Architect. Deviations from drawings and specifications shall be made in submittal form and shall include all information for approval including drawings where required. No change for extra work will be allowed unless such extra work has been duly authorized by a written order of the Architect stating the change to be made.

1.13 SEQUENCING AND SCHEDULING

- A. Coordinate electrical equipment installation with other building components.
- B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.

- C. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in the building.
- E. Coordinate connecting electrical service to components furnished under other Sections.
- F. Coordinate connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate installing electrical identification after completion of finishing where identification is applied to field-finished surfaces.
- H. Coordinate installing electrical identifying devices and markings prior to installing acoustical ceilings and similar finishes that conceal such items.

1.14 AS-BUILT DRAWINGS

- A. Contractor to provide to owner at project completion the following:
 - 1. Two (2) compact disc/DVD volumes with color pdf files showing any/all deviations to the contract documents.
 - 2. One each set of electrical plans on reproducible media indicating any/all deviations to contract documents.

1.15 COORDINATION WITH OTHER TRADES

- A. Review all specification sections and drawings including HVAC, plumbing and other equipment drawings and other divisions of the specifications for equipment requiring electrical service. Provide service to and make connections to all such equipment requiring electrical service.
- B. Contractor to coordinate all aspects of mechanical equipment furnished and installed by others with approved equipment submittals prior to any roughing. It is the responsibility of this contractor to coordinate phase, voltage, minimum circuit amps and maximum over-current protective devices with approved submittals prior to roughing. Coordinate exact connection locations with the mechanical contractor prior to any roughing. Notify engineer in writing of discrepancies between the plans and the approved equipment data.
- C. Contractor to coordinate all aspects of plumbing equipment furnished and installed by others with approved equipment submittals prior to any roughing. It is the responsibility of this contractor to coordinate phase, voltage, minimum circuit amps and maximum over-current protective devices with approved equipment submittals prior to roughing. Coordinate exact connection locations with plumbing contractor prior to any roughing. Notify engineer in writing of discrepancies between the plans and the approved equipment data.
- D. Coordination Shop Drawings: Electrical contractor shall coordinate with other trades (structural, mechanical, plumbing, and fire protection) to determine the space required, and the routing and locations of their respective trades. Prepare shop drawings at $\frac{1}{4}" = 1'-0"$ scale for all electrical rooms and rooms with electrical panels, main data frame room (MDF), intermediate data frame rooms (IDF), and corridors showing electrical, fire protection, mechanical, and plumbing work with elevations to equipment, conduit

routing, and clearances for equipment noted. Failure to coordinate does not constitute a change order when components will not fit within the allocated space and may result in installed equipment and materials being removed at the contractor's expense.

- E. Electrical requirements, roughing locations, auxiliary conduit requirements, etc. for Door control equipment, SCBA equipment, Laundry equipment, and Kitchen equipment shall be coordinated with approved equipment submittals prior to any roughing. Notify engineer in writing of discrepancies between plans and submittals/requirements. Contractor shall provide any/all conduits and wiring required for a complete system as specified.
- F. shall coordinate with other trades (structural, mechanical, plumbing, and fire protection) to determine the space required, and the routing and locations of their respective trades. Prepare shop drawings at $\frac{1}{4}" = 1'-0"$ scale for all electrical rooms and rooms with electrical panels, main data frame room (MDF), intermediate data frame rooms (IDF), and corridors showing electrical, fire protection, mechanical, and plumbing work with elevations to equipment, conduit routing, and clearances for equipment noted. Failure to coordinate does not constitute a change order when components will not fit within the allocated space and may result in installed equipment and materials being removed at the contractor's expense.

PART 2 - ELECTRICAL PRODUCT REQUIREMENTS

2.1 SUBMITTALS AND MATERIALS DATA

- A. For this project - all submittals under this division shall be provided in searchable PDF file format. All warranty materials and O&M manuals shall be provided in searchable PDF file format.
- B. The approval of shop drawing shall not be interpreted as a complete check by the Engineer, but will indicate only that the general specifications for the equipment to be provided is satisfactory. Approval of such drawings does not relieve the contractor of responsibility of coordination of components, auxiliary equipment, accessories or special conditions required for satisfactory operation of the completed system.
- C. All shop drawings for a specific item shall be made in one submittal. No submittals will be checked until all required submittals are received by the Engineer. All submittals must be approved prior to commencing any work on this project.
- D. The electrical contractor shall check all suppliers' submittals regarding measurements, capacity, performance, and details to satisfy him/herself that they conform to the intent of the contract drawings and specifications. Shop drawings and submittals shall bear the stamp of approval of the Contractor as evidence that the drawings have been checked by him. Drawings submitted without this stamp of approval will not be considered and will be returned for contractor approval and stamp. A minimum of ten (10) working days shall be allowed for checking for submittals.
- E. Any materials and equipment listed which are not in accordance with specification requirements may be rejected.
- F. All submittals shall clearly identify the item submitted. Standard catalog sheets shall be marked, in ink to identify which item is to be considered. All drawings submitted must be by factory as field drawings will not be accepted.

2.2 ELECTRICAL PRODUCT SUBSTITUTIONS

- A. Any proposed substitution of equipment or materials from that specified must be submitted in writing to the Engineer within ten (10) days prior to the bid date. The Engineer will respond in writing as to the acceptance/rejection of the proposed product. Faxed transmittals, e-mails and verbal requests will not be considered.
- B. All proposed substitutions shall clearly identify the item submitted as well as the technical information that is called for in other portions of the Electrical Divisions of this Specification. Standard catalog sheets shall be marked, in ink to identify which item is to be considered. All drawings submitted must be by prepared by the factory as field/distributor-prepared drawings will not be accepted.
- C. It is the contractor's sole responsibility to insure that any/ all costs associated with additional materials, labor, setup, programming and coordination required for, or associated with, the inclusion of any products/ systems specified as an equal or pre-approved equal to the product/ system specified in his/ her bid are included in the bid price. No change order will be accepted on the basis of additional work or materials required as a result of a product substitution.

PART 3 - EXECUTION

NOT APPLICABLE

END OF SECTION

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. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

- A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. Encore Wire Corporation.
 - 3. General Cable Technologies Corporation.
 - 4. Southwire Incorporated.
- B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2, THWN-2, Type XHHW-2, and Type SO.
- D. VFC Cable:
 - 1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.

2. Type TC-ER with oversized crosslinked polyethylene insulation, dual spirally wrapped copper tape shields and three bare symmetrically applied ground wires, and sunlight- and oil-resistant outer PVC jacket.
3. Comply with UL requirements for cables in Classes I and II, Division 2 hazardous location applications as required.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AFC Cable Systems, Inc.
 2. Hubbell Power Systems, Inc.
 3. Ideal Industries, Inc.
 4. O-Z/Gedney; a brand of the EGS Electrical Group.
 5. 3M; Electrical Markets Division.
 6. Tyco Electronics.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper - Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND WIRING METHODS

- A. Service Entrance: Type XHHW-2, single conductors in raceway (Southwire SIMPull or approved equal). Cross-linked polyethylene (XLP) insulation.
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway (Southwire SIMPull or approved equal).

- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway (Southwire SIMPull or approved equal).
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway (Southwire SIMPull or approved equal). Cross-linked polyethylene (XLP) insulation.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN-2-THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.
- H. Branch Circuits Installed below Raised Flooring: Type THHN-2-THWN-2, single conductors in raceway.
- I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

- 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

- C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."

- B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to IBC 711 and 712, latest revision."

3.8 FIELD QUALITY CONTROL

- A. Provide third party, NETA certified technician to perform the following tests and inspections:

- 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance conductors, all panelboard feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements.

- a. Generator Set.

- 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

- 3. Perform electrical test.

- B. Test and Inspection Reports: Prepare a written report to record the following:

- 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

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: Grounding systems and equipment.
- B. Section includes grounding systems and equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Test wells.
 - 2. Ground rods.
 - 3. Ground rings.
 - 4. Grounding arrangements and connections for separately derived systems.
 - 5. Grounding for sensitive electronic equipment.
 - 6. Grounding equipment enclosures.
- B. Field quality-control reports.

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 UL 467 for grounding and bonding materials and equipment.
- C. Comply with NFPA 70, Section 250 (National Electrical Code) for grounding and bonding.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.

3. Tinned Conductors: ASTM B 33.
 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 12 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, 3/4 inch diameter by 10 feet in length.
- B. Chemical-Enhanced Grounding Electrodes (where required to achieve specified grounding system resistance values): Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.
 1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
 2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
 1. Bury at least 24 inches below grade.
- C. Grounding Bus: Install in electrical and telephone/IT equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.
- D. Conductor Terminations and Connections:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 4. Connections to Structural Steel: Welded connectors.
 5. Connection to Ufer electrode – Welded connector
- E. All cable trays to be grounded per NFPA 70, Article 392 as required for conductor enclosure in accordance with NFPA 70 article 250. Provide bonding jumpers (#8 AWG) between each section. Provide bonding jumper (#4 AWG) from tray system to system ground. Bond all conduits terminated at cable tray

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
1. Feeders and branch circuits.
 2. Lighting circuits.
 3. Receptacle circuits.
 4. Single-phase motor and appliance branch circuits.
 5. Three-phase motor and appliance branch circuits.
 6. Flexible raceway runs.
 7. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.
 3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- F. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 2. For grounding electrode system, install at least three rods spaced at least two-rod lengths from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- D. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each above-ground portion of gas piping system downstream from equipment shutoff valve.

- E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
- F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- G. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
 - 1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
 - 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.4 LABELING

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.
- B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
 - 1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 - 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations

of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Nonmetallic slotted channel systems. Include Product Data for components.
 - 4. Equipment supports.
 - 5.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in architectural specifications

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements specified elsewhere "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.
- E. All cable trays to be grounded per NFPA 70, Article 392 as required for conductor enclosure in accordance with NFPA 70 article 250. Provide bonding jumpers (#8 AWG)

between each section. Provide bonding jumper (#4 AWG) from tray system to system ground. Bond all conduits terminated at cable tray.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements specified elsewhere "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete unless otherwise shown. Concrete materials, reinforcement, and placement requirements are specified elsewhere.

- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements specified elsewhere in these specifications for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

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. Metal conduits, tubing, and fittings.
 - 2. Non-metal conduits, tubing, and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Non-metal wireways and auxiliary gutters.
 - 5. Boxes, enclosures, and cabinets.
 - 6. Hand holes and boxes for exterior underground cabling.

1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

- A. Product Data: For all products specified in this section.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.
- C. Samples: For wireways and/or nonmetallic wireways and surface raceways and for each color and texture specified, 12 inches long.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Structural members in paths of conduit groups with common supports.
 - 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- B. Qualification Data: For professional engineer.
- C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal 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.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

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

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company; a division of John Maneely Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

- a. Material: Steel.
 - b. Type: Setscrew or compression.
- 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
- J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NON-METALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Anamet Electrical, Inc.
 - 3. Arnco Corporation.
 - 4. CANTEX Inc.
 - 5. CertainTeed Corp.
 - 6. Condux International, Inc.
 - 7. Electri-Flex Company.
 - 8. Kraloy.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Niedax-Kleinhuis USA, Inc.
 - 11. RACO; a Hubbell company.
 - 12. Thomas & Betts Corporation.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. LFNC: Comply with UL 1660.
- E. RTRC: Comply with UL 1684A and NEMA TC 14.
- F. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- G. Fittings for LFNC: Comply with UL 514B.
- H. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.
 2. Hoffman; a Pentair company.
 3. Mono-Systems, Inc.
 4. Square D; a brand of Schneider Electric.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Screw-cover type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Adalet.
 2. Cooper Technologies Company; Cooper Crouse-Hinds.
 3. EGS/Appleton Electric.
 4. Erickson Electrical Equipment Company.
 5. FSR Inc.
 6. Hoffman; a Pentair company.
 7. Hubbell Incorporated; Killark Division.
 8. Kraloy.
 9. Milbank Manufacturing Co.
 10. Mono-Systems, Inc.
 11. O-Z/Gedney; a brand of EGS Electrical Group.
 12. RACO; a Hubbell Company.
 13. Robroy Industries.
 14. Spring City Electrical Manufacturing Company.
 15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
 16. Thomas & Betts Corporation.
 17. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Metal Floor Boxes:
 - 1. Material: As shown on the plans.
 - 2. Type: As shown on the plans.
 - 3. Shape: Rectangular.
 - 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- J. Gangable boxes are prohibited.
- K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- L. Cabinets:
 - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.
 - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
 - 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
 - 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. Composite Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hubbell - Quazite
 - b. Carson Industries LLC.
 - c. CDR Systems Corporation; Hubbell Power Systems.
 - d. Oldcastle Precast, Inc.; Christy Concrete Products.
 - e. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
 2. Standard: Comply with SCTE 77.
 3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
 4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 6. Cover Legend: Molded lettering, "ELECTRIC." or as shown on the plans.
- C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers as called for on plans.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. CDR Systems Corporation; Hubbell Power Systems.
 - d. NewBasis.
 - e. Nordic Fiberglass, Inc.
 - f. Oldcastle Precast, Inc.; Christy Concrete Products.
 - g. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
 2. Standard: Comply with SCTE 77.
 3. Color of Frame and Cover: Green.
 4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
 5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 7. Cover Legend: Molded lettering, "ELECTRIC." or as shown on the plans.

2.6 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Hand hole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
1. Tests of materials shall be performed by an independent testing agency.

2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed Conduit: GRC IMC.
 2. Concealed Conduit, Aboveground: GRC IMC.
 3. Underground Conduit: RNC, Type EPC-40-PVC or Type EPC-80-PVC (as shown on the Plans), direct buried or concrete encased as shown on the Plans.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed, Not Subject to Physical Damage: EMT with compression couplings and fittings.
 2. Exposed, Not Subject to Severe Physical Damage: EMT with compression couplings and fittings.
 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 5. Damp or Wet Locations: GRC or IMC.
 6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

- F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- G. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 - 5. Change from RNC, Type EPC-40-PVC, to GRC or IMC before rising above floor.
- J. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

- L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- P. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- Q. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- R. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- S. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- T. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- U. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.

- c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
 - V. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
 - W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated.
 - X. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
 - Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
 - Z. Locate boxes so that cover or plate will not span different building finishes.
 - AA. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
 - BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
 - CC. Set metal floor boxes level and flush with finished floor surface.
- 3.3 INSTALLATION OF UNDERGROUND CONDUIT
- A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in civil specifications for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in civil specifications
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in civil specifications
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Underground Warning Tape: Comply with requirements in Section 260553 "Electrical Identification."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes with bottom below frost line.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in architectural specifications for Through-Penetration Firestop Systems."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.

26 05 33 - 12 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

26 05 44 - 1 SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
 - 2. Sleeve-seal systems.
 - 3. Sleeve-seal fittings.
 - 4. Grout.
 - 5. Silicone sealants.
- B. Related Requirements:
 - 1. Architectural specifications for "Through-Penetration Firestop Systems" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:

26 05 44 - 2 SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 3. Pressure Plates: Stainless steel.
 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Description: Non-shrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

26 05 44 - 3 SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

- a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in architectural specification section for "Joint Sealants."
- b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION

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. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.

- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.3 FLOOR MARKING TAPE

- A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.4 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 - 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.

2.5 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

2.6 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
 - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
- B. Nameplate color and information required on nameplate as shown on the Plans.

2.8 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F.
 - 5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.

- D. Attach signs and plastic labels with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- G. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
- H. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 10-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Fire Alarm System.
 - 3. Power feeders
 - 4. Intercom System
 - 5. Sound Systems
 - 6. IT Systems
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder, and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Phase A Neutral: White, Black stripe.
 - 5) Phase B Neutral: White, Red stripe.
 - 6) Phase C Neutral: White, Blue stripe.

- c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Phase A Neutral: White/Gray, Brown stripe.
 - 5) Phase B Neutral: White, Gray, Orange stripe.
 - 6) Phase C Neutral: White/Gray, Yellow stripe.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.
- F. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive vinyl labels with the conductor designation.
- G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
- 1. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- I. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
- 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
 - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.

- K. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- L. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.
- M. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Labeling Instructions:
 - a. Indoor Equipment (in equipment rooms): Engraved, laminated acrylic or melamine label, screw fastened. Unless otherwise indicated, provide and install nameplates with equipment name, voltage, and phase – nameplate colors unique to system voltage.
 - b. Indoor Equipment (in finished spaces): Engraved, laminated acrylic or melamine label, secured to inside of door. Unless otherwise indicated, provide and install nameplates with equipment name, voltage, and phase – nameplate colors unique to system voltage.
 - c. Outdoor Equipment: Engraved, laminated acrylic or melamine label, screw fastened. Unless otherwise indicated, provide and install nameplates with equipment name, voltage, and phase – nameplate colors unique to system voltage
 - d. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - e. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 - 2. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Switchboards.
 - e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
 - f. Emergency system boxes and enclosures.
 - g. Enclosed switches.
 - h. Enclosed circuit breakers.

- i. Enclosed controllers.
- j. Variable-speed controllers.
- k. Push-button stations.
- l. Power transfer equipment.
- m. Contactors.
- n. Remote-controlled switches, dimmer modules, and control devices.
- o. Battery-inverter units.
- p. Monitoring and control equipment.
- q. UPS equipment.

END OF SECTION

1.1 SCOPE

- A. The contractor shall furnish short-circuit and protective device coordination studies. Studies shall be prepared by a licensed professional engineer in the state of Alabama.
- B. The contractor shall furnish an Arc Flash Hazard Analysis Study per the requirements set forth in the current version of NFPA 70E -*Standard for Electrical Safety in the Workplace*. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584 – 2012, the IEEE *Guide for Performing Arc-Flash Calculations*.
- C. The scope of the studies shall include existing and new distribution equipment.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract.

1.3 REFERENCES

- A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - 1. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
 - 2. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
 - 3. IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis
 - 4. IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings
 - 5. IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
 - 6. IEEE 1584 -Guide for Performing Arc-Flash Hazard Calculations
- B. American National Standards Institute (ANSI):
 - 1. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
 - 2. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
 - 3. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
 - 4. ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.
- C. The National Fire Protection Association (NFPA)
 - 1. NFPA 70 -National Electrical Code, latest edition
 - 2. NFPA 70E – Standard for Electrical Safety in the Workplace

1.4 SUBMITTALS FOR REVIEW/APPROVAL

- A. The studies shall be submitted to the design engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the study may cause delays in equipment shipments, approval from the Engineer may be obtained for a preliminary submittal of data to ensure that the selection of device ratings and characteristics will be satisfactory to properly select the distribution equipment. The formal study will be provided to verify preliminary findings.

1.5 SUBMITTALS FOR CONSTRUCTION

- A. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. A minimum of five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short-circuit input and output data. Electronic PDF copies of the report shall be provided upon request.
- B. The report shall include the following sections:
 - 1. Executive Summary including Introduction, Scope of Work and Results/Recommendations.
 - 2. Short-Circuit Methodology Analysis Results and Recommendations
 - 3. Short-Circuit Device Evaluation Table
 - 4. Protective Device Coordination Methodology Analysis Results and Recommendations
 - 5. Protective Device Settings Table
 - 6. Time-Current Coordination Graphs and Recommendations
 - 7. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.
 - 8. Arc Flash Labeling section showing types of labels to be provided. Section will contain descriptive information as well as typical label images.
 - 9. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.

1.6 QUALIFICATIONS

- A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.
- B. The Registered Professional Electrical Engineer shall be licensed in the state of Alabama.

- C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

1.7 COMPUTER ANALYSIS SOFTWARE

- A. The studies shall be performed using SKM Systems Analysis Power*Tools for Windows (PTW) software program or approved equal.

PART 2 PRODUCT

2.1 STUDIES

- A. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D. This study shall also include short-circuit and protective device coordination studies.

2.2 DATA

- A. Contractor shall furnish all data as required for the power system studies. The Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.
- B. Source combination may include present and future motors and generators.
- C. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner, or Contractor.
- D. If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.3 SHORT-CIRCUIT ANALYSIS

- A. Transformer design impedances shall be used when test impedances are not available.
- B. Provide the following:
 - 1. Calculation methods and assumptions
 - 2. Selected base per unit quantities
 - 3. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis
 - 4. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types,

transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.

5. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.
 6. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.
- C. For solidly-grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the engineer performing the study.
- D. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to short circuit ratings
 2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses
 3. The Power System Engineer shall notify Owner in writing, of any circuit protective devices improperly rated for the calculated available fault current.

2.4 PROTECTIVE DEVICE TIME-CURRENT COORDINATION ANALYSIS

- A. Protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.
- B. Include on each TCC graph, a complete title with descriptive device names.
- C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
- D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
- E. Plot the following characteristics on the TCC graphs, where applicable:
 1. Electric utility's overcurrent protective device
 2. Medium voltage equipment overcurrent relays
 3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
 4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
 5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves
 6. Medium voltage conductor damage curves
 7. Ground fault protective devices, as applicable
 8. Pertinent motor starting characteristics and motor damage points, where applicable
 9. Pertinent generator short-circuit decrement curve and generator damage point
 10. The largest feeder circuit breaker in each motor control center and applicable panelboard.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Provide the following:

1. A One-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
2. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.
3. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
4. The study shall include a separate, tabular printout containing the recommended settings of all adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram
5. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.
6. The Power System Engineer shall notify Owner in writing of any significant deficiencies in protection and/or coordination. Provide recommendations for improvements.

2.5 ARC FLASH HAZARD ANALYSIS

- A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2009, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis (Section 2.03) and the protective device time-current coordination analysis (Section 2.04)
- B. The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.
- C. Circuits 240V or less fed by single transformer rated less than 125 kVA may be omitted from the computer model and will be assumed to have a hazard risk category 0 per NFPA 70E.
- D. Working distances shall be based on IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.
- E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations
- F. The short-circuit calculations and the corresponding incident energy calculations

for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications.

The Arc-Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

- G. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented as follows:
 - 1. Fault contribution from induction motors should not be considered beyond 5 cycles.
- H. For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment's main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required and it shall be based on a device located upstream of the equipment to clear the arcing fault.
- I. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.
- J. Miss-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.
- K. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.
- L. Provide the following:
 - 1. Results of the Arc-Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-

- protective equipment classes and AFIE (Arc Flash Incident Energy) levels.
- 2. The Arc-Flash Hazard Analysis shall report incident energy values based on recommended device settings for equipment within the scope of the study.
- 3. The Arc-Flash Hazard Analysis may include recommendations to reduce AFIE levels and enhance worker safety.

PART 3 EXECUTION

3.1 FIELD ADJUSTMENT

- A. Contractor shall adjust relay and protective device settings according to the recommended settings table provided by the coordination study.
 - Field adjustments to be completed by the Power System Engineer under the separate Startup and Acceptance Testing contract portion of project specifications.
- B. Contractor shall make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

3.2 ARC FLASH LABELS

- A. The Power System Engineer shall provide a 4.0 in. x 4.0 in. Brady thermal transfer type label of high adhesion polyester for each work location analyzed.
- B. The labels shall be designed according to the following standards:
 - 1. UL969 – Standard for Marking and Labeling Systems
 - 2. ANSI Z535.4 – Product Safety Signs and Labels
 - 3. NFPA 70 (National Electric Code) – Article 110.16
- C. The label shall include the following information:
 - 1. System Voltage
 - 2. Flash protection boundary
 - 3. Personal Protective Equipment category
 - 4. Arc Flash Incident energy value (cal/cm²)
 - 5. Limited and Restricted Approach Boundaries
 - 6. Study report number and issue date
- D. Labels shall be printed by a thermal transfer type printer, with no field markings.
- E. Arc flash labels shall be provided for equipment as identified in the study and the respective equipment access areas per the following:
 - 1. Floor Standing Equipment - Labels shall be provided on the front of each individual section. Equipment requiring rear and/or side access shall have labels provided on each individual section access area. Equipment line-ups containing sections with multiple incident energy and flash protection boundaries shall be labeled as identified in the Arc Flash Analysis table.

2. Wall Mounted Equipment – Labels shall be provided on the front cover or a nearby adjacent surface, depending upon equipment configuration.
3. General Use Safety labels shall be installed on equipment in coordination with the Arc Flash labels. The General Use Safety labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.

3.3 LABEL INSTALLATION

- A. Labels shall be field installed by the Power System Engineer. The technician providing the installation shall have completed an 8-Hour instructor led Electrical Safety Training Course with includes NFPA 70E material including the selection of personal protective equipment.

END OF SECTION

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. Time switches.
 - 2. Photoelectric switches.
 - 3. Indoor occupancy sensors.
- B. Related Requirements:
 - 1. Section 26 27 26 "Wiring Devices" for wall-switch occupancy sensors, digital time switches and manual light switches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
 - 1. Interconnection diagrams showing field-installed wiring.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Intermatic, Inc.
 - 2. SensorSwitch
 - 3. Leviton Mfg. Company Inc.
- B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Contact Configuration: SPST.

3. Contact Rating: 20-A ballast load, 120-277-V AC.
4. Programs: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week.
5. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Cooper Industries, Inc.
 2. Hubbell Building Automation, Inc.
 3. Leviton Mfg. Company Inc.
 4. Sensor Switch, Inc.
 5. Lutron, Inc.
- B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
 4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 5. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 7. Bypass Switch: Override the "on" function in case of sensor failure.
 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.
 1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in..

2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
- D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
 1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch- high ceiling.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- high ceiling.
- E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
 1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Cooper Industries, Inc.
 2. Hubbell Building Automation, Inc.
 3. Leviton Mfg. Company Inc.
 4. Lutron Electronics Co., Inc.
 5. Sensor Switch, Inc.
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
 3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.
- C. Wall-Switch Sensor Tag WS1:
 1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft.

2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: SP. SP, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
5. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
6. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.4 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multi-conductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multi-conductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 26 05 53 "Electrical Identification."
 1. Identify controlled circuits in lighting contactors.
 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

- B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 - 2. For daylighting controls, adjust set points and dead-band controls to suit Owner's operations.

3.6 DEMONSTRATION

- A. Coordinate demonstration of products specified in this Section with demonstration requirements for networked lighting control systems specified in Section 26 09 25 "Lighting Control System".
- B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

PART 1 – GENERAL

1.1 SUMMARY

- A. The intent of this set of specifications is to provide a complete, functional, intelligent, low-voltage lighting control system for the control of incandescent, low-voltage, LED, neon, cold cathode, fluorescent, and HID lighting sources.
- B. Where shown in the drawings, the contractor shall furnish and install a complete low-voltage lighting control system consisting of, but not limited to, relays, contactors, controllers, enclosures, switch stations and miscellaneous components as required for a complete, operational lighting control system.
- C. Where applicable standards have been established, all items of equipment, individual components, and installation methods shall meet the requirements of these standards, including, but not limited to, Underwriter Laboratories, the National Electrical Code, Federal Communications Commission, and any local or state codes that may be applicable.
- D. The products specified herein are those of Intelligent Lighting Controls, Inc. Low voltage lighting control systems manufactured by the following manufactures shall be considered providing they meet the requirements of these specifications and provide the quality and performance specified herein.
 - 1. Intelligent Lighting Controls, Inc.
 - 2. N LIGHT
 - 3. Products by listed manufacturers are subject to compliance with specified requirements.
- E. Listing of a manufacturer as acceptable does not in any way relieve the contractor from the responsibility for providing a lighting control system that meets all the requirements of these specifications.
- F. All manufacturers shall submit to the specifying engineer a line-by-line compliance comparison between each specification requirement and the system being proposed.
- G. Any ambiguities in the drawing or specification shall be brought to the attention of the specifying engineer for clarification.

1.2 QUALITY ASSURANCE

- A. Factory Assembly:** All relays, contactors, controllers, enclosures, switch stations and miscellaneous components shall be factory assembled and tested. All system

components shall arrive at the job site completely pre-wired and ready for installation, requiring only the connection of lighting circuits and low-voltage control stations and/or network terminations. All connections shall be made to clearly and permanently labeled termination points. Systems that require field assembly shall not be acceptable.

- B. Manufacturer:** A minimum of 20 years' experience in the design and manufacture of lighting control equipment.
- C. Component Testing:** All system components and assemblies shall be individually tested prior to assembly. Once assembled, all finished products shall be tested for proper operation of all control functions per specifications prior to shipment.
- D. NEC Compliance:** All system components shall comply with all applicable sections of the National Electrical Code (NEC) as required.
- E. NEMA Compliance:** All system components shall comply with all applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.
- F. UL Approval:** All applicable equipment shall be UL listed under section 916 and shall bear labels indicating compliance.
- G. FCC Emissions:** All applicable equipment shall comply with FCC emissions standards specified in Part 15 and Part 68 where applicable, for commercial applications and shall bear labels indicating compliance testing. Equipment that does not meet these standards shall not be acceptable.

1.3 SUBMITTALS

- A.** The manufacturer shall provide an electronic copy of submittal drawings and data for approval prior to beginning manufacture of equipment.
- B.** Hard copy submittal package shall be provided upon request.
- C.** Submittal package shall include, but not be limited to, the following. Submittals that do not contain all the information listed below will not be considered for approval.
 - 1.** Specifications Compliance: Submit a line-by-line comparison that describes the differences between each specifications requirement and the equipment/systems being proposed. The comparison shall include a complete listing of how the proposed equipment/systems differ from that specified with regard to size, quantity, quality, a method of control, features and functions, control software functions and installation requirements.
 - 2.** System Description: Supply as part of the submittal package a brief description of the lighting control system's major features and functions.
 - 3.** Bill of Materials: Provide as part of the submittal package a detailed itemized listing of all proposed equipment, including quantities and capacities for all major system components.
 - 4.** Product Data Sheets: Provide as part of the submittal package detailed product data sheets for all major system components.
 - 5.** Riser Drawing: Provide as part of the submittal package a system riser drawing of sufficient detail to indicate the relative placement of major system components and the required connections between each. Drawings shall be project specific. Generic or typical riser diagrams shall not be acceptable.
 - 6.** Control Schedules: Provide as part of the submittal package a complete control schedule spreadsheet for relay panels, Timers, Inputs, Groups, and Presets.
 - 7.** Switch Details: Provide as part of the submittal package complete switch details including color, gangs, buttons, plate style, plate colors, and engraving.
 - 8.** Warranty: Provide as part of the submittal package a complete written warranty.

1.4 WARRANTY

- A. Manufacturer's Warranty:** Manufacturer shall provide a written warranty that shall cover all lighting control equipment. The manufacturer shall agree to repair or replace any equipment that fails due to material or workmanship for a period of 6 years.
- B. Relay Warranty:** Manufacturer shall provide a separate written warranty that shall cover all lighting control relays within the lighting control system. The manufacturer shall agree to replace any relay that fails due to material or workmanship for a period of 6 years.
- C. Warranty Period:** The warranty period shall begin after the completion of the installation and the systems field-start-up and training. Systems not provided with a field-start-up begins upon receiving of the product.

PART 2 – PRODUCTS

2.1 LIGHTLEEDER PROGRAMMABLE LIGHTING CONTROL PANELS

A. Hardware Features:

1. **Controller Back-Box:** Each programmable lighting controller shall be provided with a factory furnished; UL listed NEMA 1 enclosure designed for wall mounting. Backbox must be capable of being shipped ahead of controller chassis insert to allow for rough-in of all electrical connections prior to receipt of the controller chassis insert.
2. **Controller Chassis Insert:** Each programmable lighting controller shall be provided with a factory or field installable controller chassis insert. Controller chassis insert shall contain all controller electronics, power supplies, relays, contactors and other required components. Controller chassis inserts shall arrive at the project site completely pre-wired and require only the connection of lighting circuits and control devices.
3. **Line Voltage / Control Voltage Separation:** Each programmable lighting controller shall be provided with a mechanical barrier that separates all line voltage components and wiring from all control voltage components and wiring. An additional barrier may be installed within the line voltage section that shall provide isolation between normal and emergency circuits where required.
4. **Controller Covers:** Each programmable lighting controller shall be provided with a dead front screw-held or hinged locking cover that is designed for either surface or flush mounting. If a hinge locking door is provided, it shall be provided with a slam-latch with 2 keys and door hooks to assist in mounting.
5. **Controller Capacity/Configurations:** Controllers shall be available in sizes to accommodate 4, 8, 16, 24, 32, 40, 48, 56, and 64 relay outputs. Controllers shall be available with the electronics in the center and voltage dividers with the lighting relays on the right and left sides.

B. Electrical:

1. **Controller Power Supply:** Each programmable lighting controller shall be provided with a dual-rated, UL listed Class 2 transformer capable of either 120/277 VAC or 120/347 VAC primary (50 to 60 Hz). It shall contain an internal self-resetting fuse.

2. Connections: All connections shall be made to clearly and permanently labeled termination points.

C. Controller Electronics:

1. Controller CPU: Each programmable controller shall be provided with a CPU (Central Processing Unit) that shall provide all the programming and control functions for the entire controller.
2. Real-Time Clock: Each controller shall be provided with a Real-Time Clock used to perform all time-controlled functions. It shall use a high voltage line-sync circuit for timing and a crystal for backup. Clock accuracy shall be held +/- 2 minutes per year and displayed to the second with the line-sync setting. Real-Time Clock functions shall include time of day, day of week, date and automatic daylight saving time and leap year adjustments. Time clock shall be protected against loss of time during a power outage for a period of up to 45 days without power of any type. Daylight Saving Time shall be adjustable with an enable/disable feature. Systems relying on a single clock device shall not be acceptable.
3. Relay Driver Module: Relay output cards shall be provided to expand the controller capability from 8 to 64 relay outputs in increments of 8. Electronics shall feature surge protection and optic-isolation. It shall also provide an interface for mounting input boards.
4. Relay Control Switches: Controller shall contain push-button switches to turn all relays ON or OFF without the presence of any programming.
5. Backup and Restore: The controller shall be equipped with an internal memory backup and restore capability. It shall have the ability to backup all internal programming into additional onboard memory, verify present programming with backup, and restore programming.
6. Runtime Logging: The controller shall be equipped with memory to log the runtime of each relay. It shall be capable of storing up to 30 days or 1092 hours of data and be able to be exported in a delimitative format.
7. Non-Volatile Memory: Controller shall contain a minimum of 4 Mb of nonvolatile EEPROM memory with a data retention of >200 years and electrostatic discharge protection of >4000V.
8. Power Input Surge Suppression: The controller's 24VAC power input shall be equipped with double surge suppression to protect the electronics from transient over-voltages. Protection shall clamp over-voltages up to 123 volts.

9. Data Line Surge Suppression: The controller data line communications shall be equipped with transient voltage suppression protection that will protect the electronics from electrostatic discharge and other transient over-voltages. Protection shall clamp transients up to 8kv direct discharges and 15kv air discharges.
10. Data Line Communications: The controller shall be equipped with serial communications through RJ45 connectors for communicating on CAT-5 cable with other panels and LightSync devices. It shall also be equipped with a separate local port for communicating with LightSync devices. The communications shall consist of 2-RS485 data lines.
11. USB Serial Communications: A USB port shall be provided for programming and interfacing the system with the use of a personal computer.
12. TCP/IP Communications: A TCP/IP port shall be provided for programming and interfacing the system with a personal computer over a network (LAN) or the internet (WAN).
13. Optional Module Interface: The controller shall contain 4 ports for interfacing optional modules which include communications and power. Optional modules shall be able to be mixed on each controller.

D. Switching and Control Devices:

1. Device Node Capacity: The lighting controller shall support switch input control of up to 64 data line LightSync devices locally per panel and 254 per network for up to 16,510 devices. The first 8 device nodes shall be powered by the lighting controller. The addition of a power supply or power supply/repeater shall be required for each additional 20 device nodes. Each LightSync device shall have a unique address and shall be capable of being programmed to the applicable functions described in the Switched Input Types heading in this specification.
2. Data Line Media: The data line shall consist of RS485 communications protocol transmitted over CAT-5, CAT-5E, or CAT-6 Cable. The cable shall have male RJ45 connectors installed on each end for interfacing controllers and LightSync devices. Both daisy chain and "T" (3 direction branching) of cable runs shall be permitted. "T" branching shall be accomplished by the addition of power supply/repeaters. It shall be able to be wired in a home run configuration for LightSync devices by the addition of a LightSync Hub.

3. LightSync Switch Stations: LightSync data line switch stations shall be available in momentary push button (1-6 switches and pilots) and each switch shall have an associated pilot light. Each button shall control any or all of the relays in the lighting controllers or the dimmer outputs on the network. There shall be an option to program each pilot LED to indicate the state of any relay, Group, Preset, and static on or off. It shall also have the capability to reverse the status: LED is ON if the relay is OFF etc.
4. LightSync Photocell Controllers: The photo controller shall be provided with 256 light to dark levels (0-1800fc). It shall allow selection of 8 individual set points for OFF and ON and includes a selectable range of dead-band. It shall be programmable for 2 or 30 seconds delay. Each set point shall control any or all of the relays in the lighting controllers or the dimmer outputs on the network.
5. LightSync Input Modules: The input module shall provide 4 inputs that accept momentary, momentary PB and maintained switch closures. Each input shall be optically isolated and have the ability to accept dry contact closures or 12-24VDC signals. Each input shall control any or all of the relays in the lighting controllers or the dimmer outputs on the network. It shall provide four pilot outputs that provide the true status of relays, groups and presets. It shall be installed in the control panel or remote mounted.
6. LightSync Disable Key Switch: The disable switch shall provide an RJ45 connector that shall disable all LightSync devices down line with the closure of a key switch. It shall also provide two RJ45 connectors to pass data through. It shall indicate with an LED when the disable switch is active.
7. LightSync Occupancy Sensor Input Module: The occupancy sensor input module shall provide power and inputs for motion sensors. It shall have 4 or 8 independent inputs that shall be able to interface multiple sensors. Each input shall control any or all of the relays in the lighting controllers or the dimmer outputs on the network. It shall be installed in the control panel or remote mounted.
8. LightSync 0-10V Dimmer Output Module: The 0-10VDC dimmer output module shall be designed to control dimmable ballasts or other 0-10VDC devices. Each module shall have 4 independent output channels that can control up to 200 devices per output at .5mA per device. It shall have the capability to vary its level 256 steps between 0 and 10VDC. It shall be able to respond to photo controllers, switch inputs, DMX512 signals, and timers. Each output shall be galvanically isolated up to 1500V to protect electronics. It shall be installed in the control panel or remote mounted.

9. LightSync Motor Control Output Module: The motor control output module shall be designed to control shade motors, louver motors, blind motors, skylights, or any other class 2 DC motors. Each module shall have 4 independent outputs that can be controlled by a switch input, photocell, or timer. The control time shall be selectable from .1 to 300 seconds. Each lighting controller shall handle up to 8 modules with 4 outputs on each. Each output shall be equipped with a limit switch input for each direction of the motor.
 10. Graphical Touch Screen Control Station: The Touch screen control station shall display the status and control the lighting control panel relay outputs via pre-programmed control objects on standard or custom bitmap screens.
- E. Special Purpose Modules: The following special purpose controller nodes shall be available. Multiple modules shall be permitted per controller.
1. BACnet Control: This module shall communicate directly to the lighting controller through serial communications from the BAS system using BACnet MSTP or BACnet IP protocol. It shall be able to read the status of inputs and relays and control single or multiple relays in the lighting controller. It shall also be able to disable/enable inputs and shall be able to force timer options.
 2. DMX Control: This module shall support the control of relays using standard USITT DMX512 protocol used by theatrical lighting systems. Each relay in the lighting panel shall be configured to be controlled by any DMX channel. It shall contain a frame filter that can be set from 1 – 16 frames. It shall have a priority setting for switch inputs or DMX signals. It shall have the capability to control any 0 – 10V dimming output throughout the network. It shall display current DMX levels from the keypad.
 3. DMX Driver: This module shall send DMX signals from the lighting control panels using standard USITT DMX512 protocol used by theatrical lighting systems. Each module added to the panel shall control up to 64 channels. Each dimming output channel shall be able to be mapped to 1-512 DMX channels. It shall be 1 to 1 mapped or programmed with free software. It shall be installed in the control panel or remote mounted.
 4. Modbus Control: This module shall communicate directly to the lighting controller through RS485, RS232, or TCP serial communications from the BAS system using Modicon Modbus RTU or ASCII protocol. It shall be able to read the status of inputs and relays and control single or multiple relays in the lighting controller. It shall also be able to disable/enable inputs and shall be able to force timer options.

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5. N2 Control: This module shall communicate directly to the lighting controller through serial communications from the BAS system using Metasys-N2 protocol. It shall be able to read the status of inputs and relays and control single or multiple relays in the lighting controller. It shall also be able to disable/enable inputs and shall be able to force timer options.
 6. LonWorks Control: This module shall communicate directly to the lighting controller through serial communications from the LonWorks network. It shall be able to read the status of inputs and relays and control single or multiple relays in the lighting controller. It shall also be able to disable/enable inputs and shall be able to force timer options.
 7. Modem Control: This module shall allow communications over an analog telephone line to provide programming and status of the lighting control panel.
 8. Protocol Input Control: This module shall allow serial communications from a Modbus, N2, BACnet, or LonWorks network. It shall be capable of emulating LightSync switches or photocells for direct control and status of relays, dimmers or motor controls.
 9. DTMF Telephone Control: This module shall support Input Status, Relay Status and Control, Preset Control and Group Control in the lighting panel via voice prompted commands and DTMF signals from a touch-tone telephone.
- F. Programming: Programmable controllers shall be capable of being programmed, monitored, backed-up, or controlled through any of the below methods. All programming changes shall take effect immediately as they are programmed and shall not suspend or disable switches or other system functions. The same functions shall be available for any of the connection types.
1. Local Keypad and Display: The system user shall be able to program, monitor and control any of the controller features and functions through the use of simple menu-driven self-prompting user interface consisting of a 4-line 20-character backlit LCD display and 8 selection keys that change function based on the current operating mode.
 2. USB Serial Direct Connect: The system user shall be able to program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a USB port from a PC.
 3. Modem Connect: The system user shall be able to remotely program, monitor or control any of the controller features and functions utilizing LightLEEDer

Pro Windows-based graphical user interface software using a PC/modem on an analog phone line.

4. TCP/IP Connect: The system user shall be able to remotely program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a PC with TCP/IP on a LAN or WAN.

G. Diagnostics: Programmable controllers shall have the ability to do the following diagnostics.

1. Power Status: Each programmable lighting controller shall be provided with an LED on the controller and each output board that shall indicate that power is present.
2. Keypad: System users shall be able to view thru the keypad the current status of any relay, input, group, or preset and force any ON or OFF.
3. Software: System users shall be able to view thru the LightLEEDer Pro software the current status of any relay, input, group, or preset and force any ON or OFF. It shall also have the ability to scan the network for devices and controllers and then poll them to verify network quality.
4. Relay Cycle Test: The controller shall have a cycle test for relays to turn them off/on/off and then return them to the original state to verify proper operation. It shall display the results for each relay for turning the relay ON and OFF.
5. Device Finder: It shall have the capability through the keypad to find LightSync devices, dimmer devices, and motor devices on the network.
6. Switch Test Mode: It shall be able to enter a switch test mode, where a switch input status LED will light when switch inputs are activated. It shall disable normal control when in this mode.
7. Demo Clock: It shall have the ability to speed the clock's time by 10, 30, or 60 times for testing timer functions.

- H. Power Failure and Power-Up: Each programmable lighting controller shall be provided with circuitry that shall automatically shut down the controller whenever the incoming power fails to be delivered to the controller within required limits. When power is returned to the controller, one of the following power-up modes will be implemented for each controlled relay output in the system.
1. No Action: Upon restoration of incoming control power, the controller electronics shall be restarted and resume normal operations and all circuits will be maintained in the condition they were last in.
 2. Turn ON: Controller shall turn the selected relay output to the ON state after power-up.
 3. Turn ON if Input Closed: Controller shall turn the selected relay output to the ON state after power-up if local input selected is closed. It shall be able to select any input to monitor.
 4. Turn OFF: Controller shall turn the selected relay output to the OFF state after power-up.
 5. Turn OFF if Input Closed: Controller shall turn the selected relay output to the OFF state after power-up if local input selected is closed. It shall be able to select any input to monitor.
 6. On if Open Time, OFF if Closed Time: Controller shall turn the selected relay output to the ON state during Open hours and shall turn selected relay outputs to the OFF state during Closed hours. This shall be used in conjunction with OPEN/CLOSED timers.
 7. OFF if Open Time, ON if Closed Time: Controller shall turn the selected relay output to the OFF state during Open hours and shall turn selected relay outputs to the ON state during Closed hours. This shall be used in conjunction with OPEN/CLOSED timers.
 8. Time of Day: Controller shall turn the selected relay output to the ON or OFF state based on the time of day in 30-minute increments for every day of the week.
- I. True Relay Status Feedback: Each controller shall be provided with circuitry that shall monitor the actual current status of each relay via a set of pilot contacts mechanically linked to the relay main contacts.

J. Switch Input Details: All switch inputs shall have the following options:

1. Input Flexibility: Each switch input shall accept a 2 or 3 wire maintained or momentary switch. It shall be capable of accepting a dry contact, open collector closure, or a 12-24VDC signal. Each switch shall be able to have 2 switch types associated with it in an A/B form.
2. Input to Output Programmability: Any switch input shall be programmed to control any or all of the controller's relay outputs without limitations in the network.
3. Input Logic Conditionals: All switch inputs shall have 2 conditionals that add a logic "AND" or "OR" dependent on a relay on, a relay off, an "on" input opened or closed, and an "off" input opened or closed. It shall also have a priority level setting.
4. Input Active Times: All switch inputs shall have a time-of-day or open/close time of action. This shall change the switch type on the time of day for every 30 minutes or change per open/closed times.
5. Input Types:
 - a) Momentary ON/OFF: When momentary contact is made between the ON and COM, relay outputs controlled by this input shall be turned ON. When momentary contact is made between OFF and COM, relay outputs controlled by this input shall be turned OFF.
 - b) Momentary ON/OFF w/Blink: When momentary contact is made between the ON and COM, relay outputs controlled by this input shall be turned ON. When momentary contact is made between OFF and COM, relay outputs controlled by this input shall blink and postpone being turned OFF. The alert time shall be programmable from 2 to 99 minutes. The blink alert function shall blink each relay twice prior to turning OFF. If an ON command is received during the blink alert time, relay output shall be overridden and left ON for the override time. Override times shall be adjustable from 5 to 999 minutes in 1-minute increments.
 - c) Momentary Push-Button ON/OFF: When momentary contact is made between the ON and COM, relay outputs controlled by this input are turned ON and OFF alternately, based on current state, each time contact is made.

- d) Momentary Push-Button ON: When momentary contact is made between the ON and COM, relay outputs controlled by this input shall be turned ON.
- e) Momentary Push-Button OFF: When momentary contact is made between ON and COM, relay outputs controlled by this input shall be turned OFF.
- f) Momentary Push-Button Toggle: When momentary contact is made between ON and COM, relay outputs controlled by this input shall toggle from the present state.
- g) Maintained ON/OFF: When contact is made between the ON and COM, relay outputs controlled by this input are turned ON. When contact is broken between ON and COM, relay outputs controlled by this input are turned OFF.
- h) Maintained Multi-way: When contact is either made or broken between the ON and COM, relay outputs controlled by this input will be toggled between ON and OFF conditions. This function shall be similar to that of standard 3 and 4-way switches.
- i) Maintained ON/OFF w/Blink: When contact is made between the ON and COM, relay outputs controlled by this input are turned ON. When contact is broken between ON and COM, relay outputs controlled by this input shall blink and postpone being turned OFF. The alert time shall be programmable from 2 to 99 minutes. The blink alert function shall blink each relay twice prior to turning OFF. If an ON command is received during the blink alert time, relay output shall be overridden and left ON for the override time. Override times shall be adjustable from 5 to 999 minutes in 1-minute increments.
- j) Timed ON: The timed-ON input shall operate either from the input closure or open. If programmed to operate from the closure, the relays turn ON when the input closes and turn OFF after the time duration. The relays do nothing when the input opens. If programmed to operate from the open, the relays turn ON when the input closes and remain ON. When the input opens, the relays turn OFF after the timed-ON duration.
- k) HID Bi-Level: This feature requires the configuration of ON/OFF relay outputs and HI/LOW relay outputs. The first momentary contact between ON and COM sets the ON relay outputs to ON and the HI/LOW outputs to HI (for at least 15 Minutes). The second contact

switches the HI/LOW outputs to LOW. Additional contact closures will toggle the HI/LOW relay outputs. The cycle then repeats until momentary contact is made between switch input OFF and COM. then the ON/OFF outputs and HI/LOW outputs are turned OFF.

- l) Two-Step Alternating Sequence: The first time the switch is activated, relay outputs programmed as "Group A" are turned ON and relay outputs programmed as "Group B" are turned OFF. The second time the switch is activated, "Group A" relay outputs are turned OFF and "Group B" relay outputs are turned ON. The third time the switch is activated, the pattern begins again at step one.
 - m) Four-Step Alternating Sequence: The first time the switch is activated, relay outputs programmed as "Group A" are turned ON and relay outputs programmed as "Group B" are turned OFF. The second time the switch is activated, "Group A" relay outputs are turned OFF and "Group B" relay outputs are turned ON. The third time the switch is activated; both "Group A" and "Group B" relay outputs are turned ON. The fourth time the switch is activated; both "Group A" and "Group B" relays are turned OFF. The fifth time the switch is activated, the process begins again at step one.
 - n) Set Preset: When momentary contact is made between the ON and COM, the selected preset scene will be activated.
 - o) Force Timer: When momentary contact is made between the ON and COM, the selected timer will be activated.
- K. Timer Functions: Each of the programmable lighting controllers shall have the described timer options listed below for the relay outputs.
- 1. Time of Day Timers: Each programmable lighting controller shall be provided with a minimum of 128 available timers (scheduled events) for use in developing time-of-day automated schedules. Each timer shall have the ability to turn any or all relay outputs ON or OFF at any time in 1-minute increments. Timers shall be day-of-week selectable and may be programmed to activate on any combination of days of the week. Each shall be capable of being programmed to be enabled or disabled for any day of the calendar year.
 - 2. Astronomical Scheduling: Each controller shall contain an astronomical time clock that shall calculate sunrise and sunset times based on the geographical latitude and longitude positioning. Sunrise and sunset times may be used as activation times for any system timer. In addition to sunrise and sunset time activation, the control shall be capable of programming activation time before and after these times based on an offset of 1-999 minutes.

3. Open/Closed Time Control: The user shall also have the option of controlling relay outputs in relation to the Open/Closed times of the facility. The Open/Closed times may vary for different days of the week and may be programmed for each day of the year. In addition to Open/Closed time activation, the control shall be capable of programming activation time before and after these Open/Closed times based on an offset of 1-999.
 4. OFF Hour Sweeps: The system shall also support after hours OFF sweeps of selected relay or groups of relays at user defined one, two, or three-hour intervals.
- L. Relay Output OFF Options: Each relay shall have the option to control the relay OFF in a certain way other than the default OFF.
1. Single Blink Alert: Each relay output within the programmable lighting controller shall be individually programmable to blink and postponed prior to being turned OFF. The alert time shall be programmable from 2 to 99 minutes. The blink alert function shall blink each relay twice prior to turning OFF with a timer OFF sweep to warn occupants of the upcoming OFF event. If an ON command is received during the blink alert time, the relay output shall be overridden and left ON for the override time. Override times shall be adjustable from 5 to 999 minutes in 1-minute increments.
 2. Double Blink Alert: Each relay output within the programmable lighting controller shall be individually programmable to blink and postponed prior to being turned OFF and then blinked 1 minute before turning OFF. The alert time shall be programmable from 2 to 99 minutes. The blink alert function shall blink each relay twice for each alert to warn occupants of the upcoming OFF event. If an ON command is received during the blink alert time, the relay output shall be overridden and left ON for the override time. Override times shall be adjustable from 5 to 999 minutes in 1-minute increments.
 3. HID Delay: Each relay output within the programmable lighting controller shall have the ability to be controlled like a Single Blink Alert as described above but without the blink alert to prevent damage to HID lamps.
 4. Alarm ON: Relays shall be capable of performing a momentary ON function. The ON function shall be programmable from 1 to 99 seconds.
 5. Alarm OFF: Relays shall be capable of performing a momentary OFF function. The OFF function shall be programmable from 1 to 99 seconds.

6. Alarm Pulsed ON: Relays shall be capable of being cycled ON and OFF at 1-second intervals and returning to the OFF state. It shall be programmable from 1 to 90 seconds.
 7. Alarm Pulsed OFF: Relays shall be capable of being cycled OFF and ON at 1-second intervals and returning to the ON state. It shall be programmable from 1 to 90 seconds.
 8. Automatic Control Switch-OFF: Relays shall be capable of being cycled OFF for 5 seconds and then returned to the ON state for controlling Sentry or AS110 switches.
 9. Automatic Control Switch-Blink: Relays shall be capable of being cycled OFF for 1.5 seconds and then returned to the ON state for controlling Delay-OFF mode on AS110 switches.
- M. Presets: The lighting controller shall support up to 256 user-defined presets of ON/OFF relay patterns. The presets shall be invoked by a switch or timer actuation.
- N. Descriptive Names: The system shall support the optional assignment of descriptive names (up to 10 characters) to the lighting controller, relay outputs, relay groups, inputs, timers, and presets. These names shall be able to switch from custom names to default names.
- O. Password Protection: Each Programmable controller shall have user definable 6 digit alphanumeric passwords with 2 levels of access. It shall have control and edit for level 1 and control only access for level 2.
- P. Networking:
1. Network Capacities: In addition to the data line devices mentioned in Section D, LightLEEDer Controllers shall be linked together on the data line to form a Local Area Network (LAN) of up to 254 controller nodes.
 2. Network Features: The basic network manager shall allow connection of up to 254 controllers and 254 data line devices (on top of the 64 devices per panel) and provide USB communications. The advanced network manager shall have a high-speed LightSync scanner, 4 gateway device ports, power for LightSync devices, and TCP/IP along with the items in the basic network manager.
 3. Network Universe: The network of panels shall be capable to connect to other networks over a network (LAN) or over the internet (WAN) to interconnect multiple systems.

4. Network Gateway: The following special purpose gateways shall be available and provides network wide control from a single point for its specialized function:
 - a) DTMF Telephone Control: The telephone gateway shall support the control of relays, presets and groups on the network via voice prompted commands and DTMF signals from a touch-tone telephone.
 - b) DMX Control: The DMX gateway shall support the control of relays on the network from a single point connection using standard USITT DMX512 protocol used by theatrical lighting systems.
 - c) Modbus Control: The Modbus gateway shall support communications from the BAS system using Modicon Modbus protocol from a single point connection. All network input status, relay status, and control shall be supported.
 - d) N2 Control: The N2 gateway shall support communications from the BAS system using a Metasys-N2 protocol from a single point connection. Network wide group status and control shall be supported.
 - e) BACnet Control: The BACnet gateway shall support communications from the BAS system using BACnet MSTP or BACnet IP protocol from a single point connection. It shall allow up to 500 single relays, 100 multiple relays, 48 groups, and 48 presets.
 - f) LonWorks Control: The LonWorks gateway shall support communications from the BAS systems using LonWorks protocol from a single point connection. It shall allow up to 200 single relays, 100 multiple relays, 48 groups, and 48 presets.
5. BAS System / Lighting Control System: Programmable lighting controllers integrated/interfaced to other building control and alarm systems must remain completely functional and continue to process all programmed commands, including time schedules and local switching.

- Q. Runtime Logging and Trending: Each lighting control panel shall be capable of logging Runtime and Trending data for each relay. This data shall be able to be harvested and exported from the entire system.
1. Runtime Logging: The controller shall be able to internally log the runtime of each relay for up to 30 days. This data shall be able to be harvested with a personal computer at 1-minute intervals.
 2. Logging and Trending Software: Runtime Logging and Trending software shall be available for harvesting data from the lighting control panels. It shall have a dedicated personal computer connected to the system through a LAN or USB cable to the panel or network controller.
 - a) Load Configuration: Each relay in the system shall be able to have a wattage load assigned to it to represent the actual load on the relay. Loads shall be able to be named, or names shall be exported directly from the system programming software.
 - b) Combined Loads: Up to 254 combined relay loads shall be allowed, for total wattage recording of areas in the facility. The combined loads shall allow relays from any panel in the network. Combined loads shall be able to be named for identification in reports and graphs.
 - c) Daily or Monthly Usage Report: The software shall be capable of generating spreadsheet reports in a daily or monthly format for each relay or combined relays in the system.
 - d) Export Data: The compiled reports shall be able to be exported to a .csv (comma separated value) file. These files when exported shall be coded for the year, month, and date.
 - e) Daily or Monthly Usage Graphs: The software shall be capable of generating usage graphs in a daily or monthly format for each relay or combined relays in the system.
 - f) Printing: Daily or monthly usage graphs shall have the capability to be directly printed from the software.
 - g) Live Usage Graphs: The software shall have 1 to 9 live usage meter dials to display the present wattage of combined loads.

LL-EVO DISTRIBUTED LIGHTING CONTROLLER:

- A. LL-EVO Distributed Lighting Controller: Each controller shall be designed to be remotely installed and provide control of 1-4 remote load control relays. This controller shall have the same features as the Programmable Lighting Control Panels excluding add-ons and naming.
1. Enclosure: Each controller shall be provided with a NEMA 1 galvanized steel enclosure with a removable screw cover. It shall also be provided with a 1/2" nipple for mounting directly onto a junction box and pre-drilled mounting holes.
 2. Plenum Rated: Each controller shall be suitable for plenum mounting. Controllers without this rating shall be unacceptable.
 3. Controller Power Supply: Each lighting controller shall be provided with a dual-rated, UL listed Class 2 transformer capable of either 120/277 VAC or 120/347 VAC primary (50 to 60 Hz). It shall contain an internal self-resetting fuse.
 4. High Voltage Connections: Each controller shall be provided with 6" color coded wire leads for terminating the high voltage connections. All connections shall be made to clearly and permanently labeled termination points.
 5. Low Voltage Connections: Controllers shall also be provided with RJ45 connectors for the data line connections and remote relays. It shall also be provided push-to-connect connectors for occupancy sensors, dimming, and photocells. All connections shall be made to clearly and permanently labeled termination points.
 6. Occupancy Sensor Inputs: It shall have 4 independent inputs, and each input shall be able to interface multiple occupancy sensors or hardwired switches. Each input shall control any or all the relays in the lighting controllers or the dimmer outputs. Each controller shall provide 24VDC total power for the occupancy sensors with the following current capabilities:
 - 200mA w/4 LightSync devices connected to controller
 - 160mA w/5 LightSync devices connected to controller
 - 120mA w/6 LightSync devices connected to controller
 - 90mA w/7 LightSync devices connected to controller
 - 60mA w/8 LightSync devices connected to controller

7. Photocell Inputs: It shall provide an integrated interface for up to 2 ILC photocell heads. The photo controller shall be provided with 256 light to dark levels (0-1800fc). It shall allow selection of 8 individual set points for OFF and ON and includes a selectable range of dead-band. It shall be programmable for 2 or 30 seconds delay. Each set point shall control any or all of the relays in the lighting controllers or the dimmer outputs.
8. Local Data Line Port: It shall provide an RJ45 data line port for up to 61 LightSync data line devices. It shall provide power for LightSync devices as described in item "f", or additional power added with an optional Power Supply Repeater.
9. Dimming: Room controllers shall be provided with 4 independent 0-10V dimming control outputs that shall sink a maximum of 100mA per output. Each output shall be galvanically isolated up to 1500V to protect the electronics. Each output will revert to 100% upon a power loss.
10. Real-Time Clock: Each controller shall be provided with a Real-Time Clock used to perform all time-controlled functions. It shall use a high voltage line-sync circuit for timing and a crystal for backup. Clock accuracy shall be held +/- 2 minutes per year and displayed to the second with the line-sync setting. Real-Time Clock functions shall include time of day, day of week, date and automatic daylight-saving time and leap year adjustments. Time clock shall be protected against loss of time during a power outage for a period of up to 45 days without power of any type. Daylight Saving Time shall be adjustable with an enable/disable feature. Systems relying on a single clock device shall not be acceptable.
11. Pre-Configured Programs: Each controller shall have up to 16 pre-configured lighting application programs. Each lighting application program shall be selectable with a switch on the controller.

B. Remote Relays: Each distributed lighting controller shall be provided with 1-4 single pole R20 or R20D relays.

1. Remote Relay Enclosure: Each remote relay enclosure shall be made of ABS/PC plastic that is UL recognized.
2. Mounting: Each relay shall have a ½" electrical nipple for attaching to an electrical box. It shall also be provided with a ½" conduit nut for fastening.
3. Line Voltage Connections: Each relay shall be provided with 600V 6" wire leads for connection to line and load. Leads shall exit through the nipple of the relay.
4. Low Voltage Connections: It shall be provided with an RJ45 connector for interfacing and controlling the relay.
5. Latching Relay: The relay shall be a latching relay and shall not change state upon a power loss.
6. Ratings: The remote relays shall be rated for a minimum of 16 amps, and up to 347VAC. It shall be rated for resistive, general, ballast, and electronic ballast loads. It shall be able to control 1/2HP motor loads up to 120VAC.
7. 0-10V Dimming: An optional 0-10V dimming relay shall be provided, designated as R20D. Wire leads shall be provided and shall exit through the nipple of the relay. Leads shall be a minimum of 6" in length. It shall be acceptable to wire the 0-10V connection with the Class1 wiring. Each relay shall be able to sink the 0-10V dimming up to 100mA.
8. Certifications: Each relay shall be UL/CUL listed to UL916 specifications. They shall be FCC Part 15. 109, Class B approved for radiated and conducted emissions.
9. Plenum Rating: The relay shall be plenum rated and clearly marked.
10. Made in the USA: Each relay shall be Made in the USA. Relays manufactured other than the USA shall be unacceptable.

2.2 ROOM CONTROLLERS:

- A. 2-Load Room Controller: Each controller shall be designed to be remotely installed and provide 2 load control relays, 4 independent Occupancy Sensor/Hardwire inputs, 2 independent 0-10V dimming outputs, 2 photocell head inputs, and a local port for 2 data line push-button switches. The room controllers shall be able to be stand-alone or networked from an Expansion Processor or lighting control panel.
1. Enclosure: Each room controller shall be provided with a NEMA 1 enclosure with a removable screw cover. It shall also be provided with a 3/4" nipple for mounting directly onto a junction box.
 2. Control Voltage: The room controller shall be available with 120/277VAC, or 120/347VAC control voltages.
 3. Relays: Each controller shall be provided with 2 single pole Reliant40 relays de-rated to 30 Amp tungsten or ballast loads at up to 347VAC.
 4. Connections: Each controller shall be provided with 6" color coded wire leads for terminating the high voltage connections. It shall also be provided with RJ45 connectors for the data line connections and push-to connect connectors for occupancy sensors, dimming, and photocells.
 5. Occupancy Sensor Inputs: Each room controller shall provide 4 hardwire inputs that can directly interface occupancy sensors or hardwired switches. Each room controller shall provide up to 200mA @ 24VDC total power for the occupancy sensors.
 6. Photocell Inputs: It shall provide an interface for up to 2 photocell heads.
 7. Local Data Line Port: Shall provide an RJ45 data line port for up to (2) 6 push-button switches.
 8. Dimming: Room controllers shall be provided with 2 independent 0-10V dimming ballast control outputs that shall sink a maximum of 100mA per output.

- B. 4-Load Room Controller: Each controller shall be designed to be remotely installed and provide up to 4 load control relays, 4 independent Occupancy Sensor/Hardwire inputs, 4 independent 0-10V dimming outputs, 2 photocell head inputs, and a local port for 2 data line push-button switches. The room controllers shall be able to be stand-alone or networked from an Expansion Processor or lighting control panel.
1. Enclosure: Each room controller shall be provided with a NEMA 1 enclosure with a removable screw cover.
 2. Control Voltage: The room controller shall be available with 120/277VAC, or 120/347VAC control voltages.
 3. Relays: Each controller shall be provided with up to 4 single pole Reliant40 relays rated for 40 Amp tungsten or ballast loads at up to 347VAC.
 4. Connections: Each relay shall be provided with terminals for 2 line and 2 load wires. It shall also be provided with RJ45 connectors for the data line connections and push-to connect connectors for occupancy sensors, dimming, and photocells.
 5. Occupancy Sensor Inputs: Each room controller shall provide 4 hardwire inputs that can directly interface occupancy sensors or hardwired switches. Each room controller shall provide up to 200mA @ 24VDC total power for the occupancy sensors.
 6. Photocell Inputs: It shall provide an interface for up to 2 photocell heads.
 7. Local Data Line Port: Shall provide an RJ45 data line port for up to (2) 6 push-button switches.
 8. Dimming: Room controllers shall be provided with 4 independent 0-10V dimming ballast control outputs that shall sink a maximum of 100mA per output.
- C. 4-Load Expansion Panel: Each panel shall be designed to be remotely installed and provide up to 4 load control relays. It shall also provide means to mount up to 2 interface modules and 1 photocell controller. Interface modules shall include; 4 input module, 4 occupancy sensor input module, 8 occupancy sensor input module, 4 photocell sensor controller, and dimming module.
1. Enclosure: Each remote expansion panel shall be provided with a NEMA 1 enclosure with a removable screw cover.

2. Control Voltage: The remote expansion panel shall be available with 120/277VAC, or 120/347VAC control voltages.
 3. Relays: Each controller shall be provided with up to 4 single pole Reliant40 relays rated for 40 Amp tungsten or ballast loads at up to 347VAC.
 4. Connections: Each relay shall be provided with terminals for 2 line and 2 load wires. It shall also be provided with RJ45 connectors for the data line connections.
- D. Expansion Processor: Each processor shall provide the Room Controllers the full ability and all of the functions of the Programmable Lighting Control Panels. With the addition of a Network Controller, the Room Controllers shall communicate with other lighting control panels and other Room Controller subnets.
- E. Room Controller Capabilities:
1. Subnet Capability: Each Room Controller subnet shall be able to support up to 16 Room Controllers of any type.
 2. Network Wide Capability: With the addition of a Network Controller, Room Controller subnets shall reside with the Programmable Lighting Control Panels 254-panel capabilities. It shall support up to 254 Room Controller subnets for a total of 4064 panels or 16,256 control relays.
 3. Room Controllers W/Relay Panels: Room Controllers shall be allowed to be connected to a Programmable Control Panel with Relay Driver Modules and relays. For every Relay Driver Module connected to the controller, the subnet capability for the Room Controllers shall decrease by 2 panels.
- F. Room Controller Programming:
1. Stand-alone: 2 and 4 load Room Controllers shall be programmable as a standalone lighting controller. Room Controllers shall be capable of being programmed, monitored, or backed-up using the Windows-based graphical software.
 2. Networked: Room Controllers and Programmable Control Panels shall be capable of being programmed, monitored, backed-up, or controlled through any of the below methods. All programming changes shall take effect immediately as they are programmed and shall not suspend or disable switches or other system functions. The same functions shall be available for any of the connection types.

- a) Local Keypad and Display: The system user shall be able to program, monitor and control any of the controller features and functions through the use of simple menu-driven self-prompting user interface consisting of a 4-line 20-character backlit LCD display and 8 selection keys that change function based on the current operating mode.
- b) USB Serial Direct Connect: The system user shall be able to program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a USB port from a PC.
- c) Modem Connect: The system user shall be able to remotely program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a PC/modem on an analog phone line.
- d) TCP/IP Connect: The system user shall be able to remotely program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a PC with TCP/IP on a LAN or WAN.

2.3 LIGHTING CONTROL RELAYS:

A. Reliant40-1 Single Pole Relay

1. Listing: Lighting control relays shall be individually UL and CUL listed and shall bear labels indicating compliance.
2. Labeling: Lighting control relays shall bear labels for relay current and SCCR ratings.
3. Endurance: Lighting control relays shall be designed and tested to have a minimum cycle life of 200,000 ON/OFF cycles @ FULL LOAD and 2,000,000 ON/OFF cycles at no load.
4. SCCR: Lighting relays shall have an SCCR rating of 18,000 amps up to 347 VAC.
5. Loads: Lighting control relays shall be designed for control of 120, 277 or 347 VAC lighting control circuits at a full 40 AMPS for Tungsten or Ballast loads, 16 AMPS for Electronic Ballasts (UL limit), and motor loads of 1.5 Hp @ 120 VAC.

6. Latching: Lighting control relays shall be designed with a latching mechanism that shall hold the relay in its last activated state indefinitely, with no change of state during an interruption of power. Solid state or electrically held relays are not acceptable.
7. Auxiliary Contacts: Each Lighting control relay shall contain an auxiliary set of contacts rated at 1 AMP 30 VAC/VDC electrically isolated but mechanically linked to the main contacts for the purpose of true status monitoring and pilot light activation.
8. Mounting: Relays shall be capable of panel mounting.
9. Lock-Out: Relays shall be equipped with an Enable/Disable switch to lock out On/Off control from the controller.
10. Actuator: Relays shall be equipped with a manual actuator switch for turning the relay ON or OFF along with status indication.

B. Reliant40-2 and 3 Pole Relay:

1. Multipole: Electrical contractor shall provide quantities of 40 AMP 2 or 3 pole relays as indicated on the drawings and schedules as specified herein.
2. Labeling: 40 AMP 2 or 3 pole relays shall be individually UL and CUL listed and shall bear labels indicating compliance.
3. Voltages: 40 AMP 2 or 3 pole contactors shall be designed for the control of 208, 240 and 480 VAC lighting loads at a full 40 Amps.
4. Mechanical Link: Poles within the relay shall be electrically isolated but mechanically linked so as to open and close together without the possibility of one pole being closed while the other remains open. Systems that utilize two single-pole relays to accomplish this function are not acceptable.

2.4 SWITCH STATIONS AND COVER PLATES

- A. Hardwired Switches and Cover Plates:** Electrical contractor shall provide and install switch plates and switches of the quantities and types shown on the drawings and specified herein.

1. NFP Momentary Switch

- a) Switch:** It shall consist of a single-pole double-throw center OFF momentary switch rated at 6 Amps @ 125 VAC. They shall be available in black, white, gray, or red colors
- b) Cover Plates:** Plates shall be available in stainless steel, brushed aluminum, or painted cold rolled steel. They shall be available with 1-3 switches per single gang plate and 4-8 in a 2-gang plate.
- c) Status:** LED status indicators shall be optional for each switch provided.
- d) Nomenclature:** Engraving shall be available on phenolic labels or directly on the plate.

2. Heavy Duty Switch

- a) Switch:** It shall consist of a single-pole double-throw center OFF momentary heavy-duty toggle or Decora® paddle switch rated at 15-20 Amps @ 120/277 VAC. They shall be available in ivory or white colors.
- b) Cover Plates:** Plates shall be available for Decora® switches in ivory, white, or stainless steel with or without visible screws and come in 1-4 gangs.
- c) Nomenclature:** Engraving shall be available on phenolic labels or directly on the plate.

3. Key Switch

- a) Key Switch:** Key switch shall consist of a single-pole double-throw momentary or maintained switch. They shall be available to allow the key to being removed in the ON position or the OFF position.

- b) Cover plates: Plates shall be available in stainless steel, brushed aluminum, or painted cold rolled steel. They shall be available with 1-2 switches per gang plate and up to 4 gangs.
- c) Status: LED status indicators shall be optional for each switch provided.
- d) Nomenclature: Engraving shall be available on phenolic labels or directly on the plate.

4. Touch Activated Switch

- a) Switch: Touch activated switch shall be a momentary output solid-state piezo type push button.
- b) Cover plates: Plates shall be available in stainless steel, brushed aluminum, or painted cold rolled steel. They shall be available with 1-3 switches per gang plate and up to 4 gangs.
- c) Gasket: Cover plate neoprene gaskets shall be available for weatherproof applications.
- d) Status: LED status indicators rings shall be optional for each switch provided.
- e) Nomenclature: Engraving shall be available on phenolic labels or directly on the plate.

B. Custom Switch Plates and Graphic Switch Stations: Electrical contractor shall provide and install custom switch plates and graphical switching stations of the quantities and types shown on the drawings and specified herein.

- a) Switch Plates: Switch plates shall consist of a control panel faceplate, switches, and other control devices as required, LED pilot lights and all mounting hardware.
- b) Material: Switch plates shall be manufactured from a single piece of stainless steel, aluminum, brass or bronze, finished and labeled as per the plans and specifications or as indicated on approved drawings.
- c) Mounting: Switch plates shall be designed to mount either to a standard electrical gang box supplied by the electrical contractor for

either flush or surface mounting or to a custom back-box supplied by the manufacturer.

- d)** Nomenclature: Switch plate graphics and labeling shall be accomplished through the use of one or a combination of multi-color anodized, engraving or phenolic labels; laser etched or painted graphics.
- e)** Graphics: Each switch station shall contain a graphic representation of the controlled space with switches and other control devices graphically located on the station so as to indicate their associated areas of control.

PART 3 – EXECUTION

3.1 INSTALLATION

1. Installation: Where shown in the drawings, the contractor shall furnish and install programmable lighting controllers of the quantities, sizes, and types shown on the drawings or specified herein.
2. Requirements: All equipment shall be installed in accordance with manufacturer requirements and in compliance with all applicable local and national codes and requirements.

3.2 MANUFACTURES SERVICES

1. Factory Programming: All controllers shall be factory programmed upon request in accordance with the project specifications prior to shipment.
2. Installation Assistance: During the installation process, the manufacturer shall provide, at no cost, technical support via a toll-free telephone line to the installing contractor or owner's representative to answer questions and supply additional information when required.
3. System Start-Up: The system manufacturer shall provide a factory authorized field technician to the project site after installation has been completed and prior to the system being energized for the purpose of testing and adjustment of the system. Factory field technician shall test and verify all system functions and ensure proper operation of the system components in accordance with the specifications and on-site conditions. The installing contractor shall notify the system manufacturer in writing that the system is completely wired and ready to be energized and tested 4 weeks prior to scheduling a field technician for the start-up of the system. Should the field technician arrive on the job site and find the installation incomplete, the installing contractor shall pay the cost of any future visits by the field technician required to complete the system start-up.
4. On-Site Programming: During the start-up procedure, the factory field technician shall provide programming assistance and guidance to the building operating personnel in order to program the systems for initial operation.
5. Instruction: During the start-up procedure, the factory field technician shall provide training to the building operating personnel in the operation, programming, and maintenance of the lighting control system.
6. As-Built Drawings: After completion of the system installation and testing, the manufacturer shall provide 3 sets of "as-built" drawings.

7. Operation and Maintenance Manuals: After completion of the system installation and testing, the manufacturer shall provide 3 sets of Operations and Maintenance Manuals.
8. Lifetime Toll-Free Telephone Support: The system manufacturer shall provide a toll-free telephone number to the system user and shall allow access to free telephone support for the life of the system.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and over-current protective devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual over-current protective devices and auxiliary components.
 - 6. Include wiring diagrams for power, signal, and control wiring.
 - 7. Include time-current coordination curves for each type and rating of over-current protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.4 INFORMATIONAL SUBMITTALS

- A. Field Quality-Control Reports:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- B. Panelboard Schedules: For installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting over-current protective devices.
2. Time-current curves, including selectable ranges for each type of over-current protective device that allows adjustments.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Keys: Two spares for each type of panelboard cabinet lock.
 2. Circuit Breakers as called for in the panel schedule.
 3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- C. Product Dimensions: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. 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.
- E. Comply with NEMA PB 1.
- F. Comply with NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations:
 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
 - b. Altitude: Not exceeding 2000 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 1. Ambient temperatures within limits specified.
 2. Altitude not exceeding 6600 feet.
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 1. Notify Architect and Owner no fewer than ten (10) days in advance of proposed interruption of electric service.
 2. Do not proceed with interruption of electric service without Architect's and Owner's written permission.
 3. Comply with NFPA 70E.

1.10 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Flush- and/or surface-mounted cabinets as shown on the plans.
 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

- e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
- 2. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pre-treating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
- 3. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.
- B. Incoming Mains Location: As required – coordinate prior to providing panelboard approval submittals.
- C. Phase, Neutral, and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
- D. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type.
 - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 - 4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 5. Sub-feed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.
- F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Standard 4-piece trim.

- D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- D. Doors: Hinged trim to box (door-in-door) flush latch with steel tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 - 4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.

- c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
- d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
- e. Shunt Trip: 24-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
- f. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
- g. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
- h. Multi-pole units enclosed in a single housing or factory assembled to operate as a single unit.
- i. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in the position indicated on the plans.

2.5 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NECA 407 and/or NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NECA 407 and/or NEMA PB 1.1.
- B. Mount such that the top-most switch or circuit breaker (in the panel) is not higher than 79 inches above finished floor or grade. Align adjacent panels for a neat appearance.
- C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- D. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- E. Install filler plates in unused spaces.

- F. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- H. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 26 05 53 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- D. Device Nameplates: For all breakers in distribution panels, label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection (only) test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73 "Electrical System Studies".

3.6 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

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. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Twist-locking receptacles.
 - 3. Receptacles with integral surge-suppression units.
 - 4. Tamper-resistant receptacles.
 - 5. Weather-resistant receptacles.
 - 6. Snap switches and wall-box dimmers.
 - 7. Wall-switch and exterior occupancy sensors.
 - 8. Communications outlets.
 - 9. Pendant cord-connector devices.
 - 10. Cord and plug sets.
 - 11. Floor service outlets, poke-through assemblies, service poles, and multi-outlet assemblies.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.
 - 3. Coordinate all device colors in writing with Architect/Engineer prior to submittal process and provide approval with submittals for devices.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Service/Power Poles: One for every 10, but no fewer than one.
 - 2. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.
 - 3. Poke-Through, Fire-Rated Closure Plugs: One for every five floor service outlets installed, but no fewer than two.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand (Pass & Seymour).
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Products: Subject to compliance with requirements, provide one of the following:

- a. Cooper; 5351 (single), CR5362 (duplex).
 - b. Hubbell; HBL5351 (single), HBL5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5361 (single), 5362 (duplex).
- B. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; TR8300.
 - b. Hubbell; HBL8300SGA.
 - c. Leviton; 8300-SGG.
 - d. Pass & Seymour; TR63H.

2.4 GFCI RECEPTACLES

- A. General Description:
 - 1. Straight blade, feed-through type.
 - 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
 - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; VGF20.
 - b. Hubbell; GFR5352L.
 - c. Pass & Seymour; 2095.
 - d. Leviton; 7590.
- C. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A :
 - 1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
 - 2. Configuration: NEMA WD 6, Configuration 5-15R.
 - 3. Type: Non feed-through.
 - 4. Standards: Comply with UL 498 and UL 943 Class A.
 - 5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.
- D. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; GFTR20.
 - b. Pass & Seymour; 2095TR.

2.5 USB RECEPTACLES

A. USB Charging Receptacles :

1. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
2. USB Receptacles: Dual, USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
3. Standards: Comply with UL 1310 and USB 3.0 devices.

2.6 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; CWL520R.
 - b. Hubbell; HBL2310.
 - c. Leviton; 2310.
 - d. Pass & Seymour; L520-R.

2.7 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.8 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Single Pole:
 - 1) Cooper; AH1221.
 - 2) Hubbell; HBL1221.
 - 3) Leviton; 1221-2.
 - 4) Pass & Seymour; CSB20AC1.
 - b. Two Pole:
 - 1) Cooper; AH1222.
 - 2) Hubbell; HBL1222.
 - 3) Leviton; 1222-2.
 - 4) Pass & Seymour; CSB20AC2.
 - c. Three Way:

- 1) Cooper; AH1223.
 - 2) Hubbell; HBL1223.
 - 3) Leviton; 1223-2.
 - 4) Pass & Seymour; CSB20AC3.
 - d. Four Way:
 - 1) Cooper; AH1224.
 - 2) Hubbell; HBL1224.
 - 3) Leviton; 1224-2.
 - 4) Pass & Seymour; CSB20AC4.
- C. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 1995.
 - b. Hubbell; HBL1557.
 - c. Leviton; 1257.
 - d. Pass & Seymour; 1251.

2.9 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: 302 Stainless steel.
 3. Material for Unfinished Spaces: Galvanized steel.
 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.10 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type activation or recess-type activation, as scheduled on the plans.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: As called for on the Plans.
- D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Modular, keyed, color-coded, RJ-45 jacks (quantity as shown on plans) for UTP cable complying with requirements in Section 269000 "Structured Cabling System."

2.11 FINISHES

- A. Device Color:
 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
 2. Wiring Devices Connected to Emergency Power System: Red.
- B. Wall Plate Color: For plastic covers, match device color as selected by Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pig tailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.

7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 8. Tighten unused terminal screws on the device.
 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Dimmers:
1. Install dimmers within terms of their listing.
 2. Verify that dimmers used for fan speed control are listed for that application.
 3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.
- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
- 3.2 GFCI RECEPTACLES
- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.
- 3.3 IDENTIFICATION
- A. Comply with Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
- 3.4 FIELD QUALITY CONTROL
- A. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 3. Ground Impedance: Values of up to 2 ohms are acceptable.

4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Non-fusible switches.
 - 3. Shunt trip switches.
 - 4. Molded-case circuit breakers (MCCBs).
 - 5. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Include evidence of NRTL listing for series rating of installed devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- B. Product Dimensions: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

1.7 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Provide mounting structure for safety switches independent of the equipment and install flexible connection from switch to equipment as required.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.2 NON-FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 SHUNT TRIP SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cooper Bussmann, Inc.
 2. Ferraz Shawmut, Inc.
 3. Littelfuse, Inc.
- B. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- C. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.
- D. Accessories:
 1. Oiltight key switch for key-to-test function.
 2. Oiltight green ON pilot light.
 3. Isolated neutral lug; 100 percent rating.
 4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
 5. Form C alarm contacts that change state when switch is tripped.
 6. Three-pole, double-throw, fire-safety and alarm relay; 24-V dc coil voltage.
 7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

2.4 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- D. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2.5 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection (only) test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73 "Electrical System Studies"

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section describes the quality, performance, and installation of Parallel Connected, AC Power, Panel Type, Surge Protective Devices (SPDs).

1.3 CODES AND STANDARDS

- A. ANSI/IEEE Std C62.41.1^a-2002, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits
- B. ANSI/IEEE Std C62.41.2^a-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
- C. ANSI/IEEE Std C62.45^a -2002, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits
- D. ANSI C8 4.1, American National Standard for Electric Power Systems and Equipment Voltage Ratings (60 Hertz)
- E. ANSI/IEEE Standard 1100-2005, IEEE Recommended Practice for Power and Grounding Electronic Equipment (Emerald Book) - Clause 8.6.1
- F. National Fire Protection Association (NFPA) 70 (N.E.C.) © 2002 - Article 285

1.4 DEFINITIONS

- A. I nominal: Nominal discharge current.
- B. MCOV: Maximum continuous operating voltage.
- C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.
- D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.
- E. OCPD: Overcurrent protective device.
- F. SCCR: Short-circuit current rating.
- G. SPD: Surge protective device.
- H. VPR: Voltage protection rating.

1.5 QUALITY ASSURANCE

- A. All Surge Protective Devices (SPDs) shall be tested and listed to ANSI/UL 1449-2006 (UL 1449 3rd Edition) and Complimentary Listed to UL 1283 by an independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a Nationally Recognized Testing Laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and

that is acceptable to authorities having jurisdiction. This agency must comply with ANSI/IEEE C62.45 test procedures for all categories established in C62.41 (1991). Manufactured in accordance with UL 1449 is not equivalent to being listed to ANSI/UL 1449-2006 and does not meet the intention of this specification.

- B. Pre-Approval submittals for products by manufacturers not listed above must be submitted not less than ten (10) business days prior to bid date to allow ample engineering time for review of submitted products. Products not submitted within this timeframe will not be reviewed.
- C. Submit proper documentation showing detailed (line-by-line) compliance with this specification. Prior approvals not received by the deadline date defined above will not be considered.
- D. Along with the line-by-line comparison from manufacturers not listed herein, pre-approval surge suppression submittals shall include all of the items listed in Section V, below.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.
 - 3. Complete schematic data for all suppressors indicating part numbers, conductor sizes, etc.
 - 4. Dimensioned drawing of each suppressor type indicating mounting arrangement.
 - 5. Manufacturers ANSI/UL 1449-2006 Third Edition listing classification page and listing number(s).
 - 6. Manufacturers UL 1283 listing classification page and listing number(s).
 - 7. Certified test data documenting ANSI/IEEE C62.41-2002 performance and the ability of the device to meet or exceed all requirements of this specification. Include complete let-through voltage/measured limiting voltage test data (not Voltage Protection Rating), test graphs, and scope traces for each mode for each product submitted for Category's C, B, A (including Cat A, 2 kV, 67 A, 100 kHz ring wave at both 90 & 270 degree electrical phase angles).
 - 8. Letter from manufacturer stating products are in strict compliance with the recommendations of IEEE Standard 1100-2005, Clause 8.6.1 and incorporate 10 individual dedicated discrete modes of protection for three-phase Wye systems, including direct line-to-line components. (Reduced-mode variations will not be accepted).
 - 9. Certificate of declaration that product is CE low voltage directive compliant
 - 10. Statement of manufacturer's warranty duration and replacement policy.

1.7 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

- B. Sample Warranty: For manufacturer's special warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For SPDs to include in maintenance manuals.

1.9 WARRANTY

- A. All SPD devices shall be warranted to be free from defects in materials and workmanship under normal use in accordance with the instructions provided for a period of twenty-five (25) years from date of substantial completion.
- B. Any SPD device that shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced as a complete unit (not just modules, subassemblies, or components) by the manufacturer at no charge to the owner. Warranty will provide for multiple exchanges of any inoperable devices at any time during the warranty period that starts at the date of substantial completion of the system to which the surge suppressor is installed.
- C. SPD manufacturers whose warranty does not meet the requirements listed above standard shall submit a letter extending the warranty to meet these standards with the product submittal

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Surge Suppression Incorporated – Specified on plans.
 - 2. Emerson (Liebert) Incorporated, (560xx16 & 570xx17) Series only.
 - 3. Current Technology (SL3-150) Series only.
- B. All surge suppression devices shall be manufactured by an ISO 9001-2000 certified company normally engaged in the design, development, and manufacture of such equipment, with at least 10 years of engineering experience in the design and manufacture of permanently connected SPD devices.
- C. The surge suppressor manufacturer shall provide unlimited free replacement of the entire SPD for all inoperable SPD units during the warranty period.
- D. The use of any mechanical or electro-mechanical thermal/over-current protection (i.e. moving parts and/or springs and shutters), in combination with or for the protection of the suppression elements are expressly prohibited and will be rejected.
- E. The listing of a manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the Contractor to ensure that any submittals made are for products that meet or exceed the specifications included herein.

2.2 GENERAL SPD REQUIREMENTS

- A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

- C. Comply with UL 1449.
- D. The Surge Protective Devices (SPD's) shall be of a parallel-connected design using fast-acting transient energy protection components that will divert and dissipate the surge energy.
- E. All SPDs shall be tested and listed to ANSI/UL 1449-2006 (UL 1449 3rd Edition) & Complimentary Listed to UL 1283 by a Nationally Recognized Testing Laboratory (NRTL) (i.e. CSA, UL, etc)
- F. SPD's shall be Type 2 SPD's, Type 4 SPD's are not permitted.
- G. The Surge Protective Devices (SPDs) shall be of a parallel-connected design using fast-acting transient energy protection components that will divert and dissipate the surge energy.
- H. The SPD shall be self-restoring and fully automatic.
- I. The SPD shall be tested and listed by an NRTL as a complete assembly to a symmetrical fault current rating greater than or equal to the available fault current at the location of installation at the connected panel, in accordance with NEC Article 285 and shall be marked with the short circuit current rating (SCCR). If the available fault current is unknown, then the SCCR of the SPD shall be 200 kAIC.
- J. Permanently connected devices mounted parallel to the service, distribution, and sub panels are required. SPD device drawings shall be made available upon request.
- K. The SPD shall have a Nominal Discharge Current (In) of 20 kA. ((The Nominal Discharge Current Test was designed to establish that the SPD remains functional after 15 surges at various currents (3 kA, 5 kA, 10 kA, and 20 kA) using the test procedure described in ANSI/UL 1449-2006. 20kA is the most severe.)
- L. Fusing:
 - 1. The SPD shall provide as a minimum, over-current, over temperature protection in the form of component-level thermal fusing to ensure safe failure and prevent thermal runaway. This component-level fusing shall be an integral part of the MOV itself and not silver wire (or other) independently laid across each MOV.
 - 2. Surge protective devices shall contain integral short circuit current safety fusing within each device for over-current requirements of the NEC. This fusing will be independent of the "component-level" fusing and be specifically for over-current protection and shall be constructed utilizing surge rated, cartridge fuses and not rated "silver-fuse-wire" (or other).
 - 3. The use of any mechanical or electro-mechanical thermal/over-current protection (i.e. moving parts and/or springs and shutters) in combination with or for the protection of the suppression elements is expressly prohibited and will be rejected.
 - 4. The fusing mechanisms employed must effectively coordinate their performance in conjunction with the high current abnormal over-voltage testing under ANSI/UL 1449-2006 (a.k.a. UL 1449 3rd Edition).
- M. MCOV: The SPD shall have a maximum continuous operating voltage (MCOV) capable of sustaining 115% of nominal RMS voltage continuously without degrading.
- N. Component Limitations: The SPD shall only use solid-state clamping components to limit the surge voltage and divert the surge current. SPD components that "crowbar"

short-circuit the AC power system (e.g. spark gaps, gas tubes, selenium cells, or SCR's) shall not be acceptable. Device circuitry shall be bi-directional, enclosed in a UL listed encapsulated thermal stress reducing compound, and be of a parallel design.

- O. Protection Modes: The SPD system shall provide (per IEEE Std. 1100-1999 8.6.1) dedicated independent, distinct, individual protection circuitry for every possible mode in the electrical distribution system at the point of SPD application. For example, a 277/480V, 3-phase Wye, 4-wire plus ground system has 10 distinct modes that require independent and dedicated protection (i.e., L1-L2, L2-L3, L3-L1, L1-N, L2-N, L3-N, L1-G, L2-G, L3-G, N-G). None of these modes of protection depend on protection elements purposed for other protection modes. Reduced mode SPD with only 3, 4, or 7 dedicated, distinct, independent protection modes are not acceptable and are not to be submitted. For 6 mode delta systems, 6 dedicated, independent, distinct protection modes are required (L1-L2, L2-L3, L3-L1, L1-G, L2-G, L3-G). When a mode of protection is specified, the protective mode must be specifically included. Thus, Line-to-Neutral-to-Line is not acceptable where Line-to-Line is specified.
- P. Sinewave Tracking Capability: Power panels and MCCs serving sensitive electronic equipment shall utilize voltage independent, dedicated Sinewave Tracking circuitry. EMI/RFI filtering specifically will not be considered as equal to sinewave tracking! To demonstrate the sinewave tracking capability of the submitted devices, manufacturers shall submit 3rd party, independent tests results for units claiming sinewave tracking capability. Such tests shall include testing under the standards of ANSI/IEEE C62.41 and C62.45 category A1 (2kV, 67A, 100kHz ring wave) applied at the 270 degree phase angle, positive polarity, on a 120/208Vrms, 3 phase Wye device, on each of the following modes: line-to-neutral, line-to-ground, and line-to-line (dynamic tests with normal voltage applied to the unit under test), and neutral-to-ground (static test with no normal voltage applied to unit under test). The "let-through voltage" derived from each of these tests shall have a maximum amplitude of less than 50V peak deviation from the insertion point of the surge on the sine wave to the peak of the transient. Measurement of the let-through voltage shall be made with six-inches of lead length external to the SPD housing in accordance with ANSI/UL 1449-2006. Performance requirements are as stated in the table in Section VIII below (ANSI/IEEE C62.41 Let-Through Voltage) at Test Category A1.
- Q. Status Indicators: SPD units shall have panel front status monitors as a minimum to indicate a continuous positive status of each protected phase. A remote audible alarm option must be supplied where the specifying engineer deems it necessary and cost effective under the circumstances. Refer to the appropriate drawings and schedules for these details.
- R. Equipment Certification: Items shall be listed to ANSI/UL 1449-2006, shall bear the seal of the NRTL, shall bear the Marking "Listed to UL 1449", shall have been tested under ANSI/UL 1449-2006, and shall be marked in accordance with the referenced standard. SPD units shall be UL 1283 Listed as an Electromagnetic Interference Filter and marked accordingly. All surge suppression devices shall be manufactured by an ISO 9001-2001 certified company normally engaged in the design, development, and manufacture of such equipment.
- S. Circuit Configuration: The circuit configuration of the suppression units shall be bi-directional, thermal stress reducing, encapsulated, custom parallel connected, and solid state. (Series units or units equipped with "load carrying" components are

expressly prohibited due to the possibility of single point series failures causing power interruption to protected loads.)

- T. Enclosures: Unless otherwise noted, provide NEMA 1 or better enclosure for indoor mounting and NEMA 4 enclosure or better for all outdoor locations. All units will contain Form C, N/O or N/C, dry relay contacts, if so specified, and weatherproof fittings to maintain the required NEMA integrity.
- U. Maintenance Restrictions: No suppression unit shall be supplied which requires scheduled preventive maintenance or replacement parts. Units requiring functional testing, special test equipment, or special training to monitor surge protection device (SPD) status are not acceptable. SPD shall require NO routine maintenance. SPD devices are considered non-repairable items and shall be fully replaced upon failure.
- V. Commonality: All SPDs at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer.

2.3 PERFORMANCE REQUIREMENTS

- A. SPDs shall meet the following performance requirements:
 - 1. Service Entrance (Category C): The SPD shall provide a minimum protection of 240kA per phase (three-phase Wye) and be capable of meeting the Category C-High Let-Through Voltage criteria as shown in the section below.
 - 2. Building Distribution Panels (Category B): The SPD shall provide a minimum protection of 180 kA per phase and be capable of meeting the Category B3-High Let-Through Voltage criteria as shown in the section below.
 - 3. Branch Panels/Panelboards (Non-Electronics) (Category A): The SPD shall provide a minimum protection of 120kA per phase and be capable of meeting the Category B-High Let-Through Voltage criteria as shown in the Section VII, below.
 - 4. Branch Panels/Panelboards (Electronics) (Category A): The SPD shall provide a minimum protection of 120kA per phase, be of sinewave tracking design, and be capable of meeting the Category A Let-Through Voltage criteria as shown in the section below.

2.4 ANSI/IEEE C62.41 LET-THROUGH VOLTAGE

- A. The SPD shall meet the Let-Through Voltage requirements shown below for voltage and locations specified. All voltages shall be peak (+or -10%) Positive Polarity, Time base = 10uS, Sampling Rate = 500ms/s to ensure maximum transient capture. These settings assure Let-through Voltage test results are accurate. Surge voltages shall be measured from the insertion of the surge on the sine wave to the peak of the surge. All tests are Static (un-powered), except for the 120V circuits that are Dynamic (powered). Let-through voltages on static tests calculated by subtracting sine wave peak from let-through measured from zero. All tests shall be performed in accordance with UL 1449 Third Edition with measurements performed at a point on the leads 15.24 cm (6 inches) outside of the device enclosure. No data measured at a module, lugs, component, or undefined location will be accepted. These settings assure Let-through Voltage test results are accurate. SPDs shall meet the following criteria:
 - 1. Service Entrance Panels - ANSI/IEEE Cat. C Impulse Wave The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. C Impulse Wave (20kV, 10,000 amps) at the 90 degree

phase angle shall be less than (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):

- a. Line to Neutral: 1075 V for 208Y/120 V and 1340V for 480Y/277 V
 - b. Line to Line: 1990 V for 480Y/277 V and 1390 V for 208Y/120 V.
 - c. Line to Ground: 1310 V for 480Y/277 V and 1060 V for 208Y/120 V.
 - d. Neutral to Ground: 1730 V for 480Y/277 V and 1450 V for 208Y/120 V.
2. Distribution and Branch Panels (non-electronics) - ANSI/IEEE Cat. B Combination Wave Impulse Let-Through Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. B Combination Wave Impulse (6kV, 3000 amps) at the 90 degree phase angle, shall be less than; (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):
 - a. Line to Neutral: 520 V for 480Y/277 V and 395 V for 208Y/120 V.
 - b. Line to Line: 790 V for 480Y/277 V and 570 V for 208Y/120 V.
 - c. Line to Ground: 500 V for 480Y/277 V and 375 V for 208Y/120 V.
 - d. Neutral to Ground: 1010 V for 480Y/277 V and 590 V for 208Y/120 V.
 3. Branch Panels Feeding Electronic Equipment - ANSI/IEEE Cat. A Ring Wave Let-through-Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. A Ring Wave (2kV, 67 amps, 100kHz ring wave) at the 270 degree phase angle, shall be less than; (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sinewave to the peak of the transient):
 - a. Line to Neutral: 67 V for 480Y/277 V and 30 V for 208Y/120 V.
 - b. Line to Line: 65 V for 480Y/277 V and 60 V for 208Y/120 V.
 - c. Line to Ground: 85 V for 480Y/277 V and 50 V for 208Y/120 V.
 - d. Neutral to Ground: 65 V for 480Y/277 V and 50 V for 208Y/120 V.

2.5 ANSI/UL 1449-2006 VOLTAGE PROTECTIVE RATING

- A. Voltage Protection Rating (VPR) is a rating selected from a list of preferred values as detailed in ANSI/UL 1449-2006 and assigned to each mode of protection. The value of VPR is determined as the nearest highest value taken from a list of preferred values (as detailed in ANSI/UL 1449-2006) compared to the measured limiting voltage determined during the transient voltage surge suppression test using the combination wave generator at a setting of 6 kV, 3 kA.

1. Single Phase Units (120/240 Volt)
 - a. Line to Neutral: 600 V .
 - b. Line to Ground: 600 V.
 - c. Neutral to Ground: 700 V.
 - d. Line to Line: 1000 V.

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2. Three Phase Units (120/208 Volt)

- a. Line to Neutral: 600 V .
- b. Line to Ground: 600 V.
- c. Neutral to Ground: 700 V.
- d. Line to Line: 1000 V.

2.6 ENCLOSURES

- A. Indoor Enclosures: NEMA 250, Type 1.
- B. Outdoor Enclosures: NEMA 250, Type 3R or Type 4X.

2.7 CONDUCTORS AND CABLES

- A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low Voltage Electrical Power Conductors and Cables."
- B. Class 1 Control Cables: Multi-conductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 260519 "Low Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.
- C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
- D. Use crimped connectors and splices only. Wire nuts are unacceptable.
- E. Wiring:
 - 1. Power Wiring: Comply with wiring methods in Section 260519 "Low Voltage Electrical Power Conductors and Cables."
 - 2. Controls: Comply with wiring methods in Section 260519 "Low Voltage Electrical Power Conductors and Cables."
- F. Provide surge suppressor at each building service entrance and at other distribution and panelboard locations as indicated on the drawings. The SPD shall be located immediately adjacent to the switchboard or panelboard being protected (close-nipple to panel-boards). The SPD may not be located integral (switchgear manufacturer installed) within the switchboard or panelboard(s) unless the switchgear manufacturer providing such SPD products expressly meets or exceeds ALL parameters of this specification for the SPD. These SPDs shall be individually tested and Listed to ANSI/UL 1449-2006 according to their type and not be listed solely as part of the larger assembly. SPD devices not meeting or exceeding the performance of this specification will be deemed unacceptable.

- G. Do not energize or connect service entrance equipment and panelboards to their sources until TVSS devices are properly installed and connected.
- H. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.
- I. Install the SPD with #10 AWG minimum conductors to dedicated 30-amp breaker(s) in panel per manufacturer's installation instructions and close to the Neutral Bus. The dedicated breaker shall serve as a means of service disconnect for the SPD so that the electrical panel remains energized during SPD servicing. The installer may rearrange breaker locations to ensure the shortest and straightest leads to the SPD. If a dedicated breaker is not provided, an SPD with internal 30-amp fuse or a UL Listed fused disconnect switch shall be installed as a minimum. The conductors serving the SPD shall be twisted together (one twist per 12" of wire) to reduce the SPD system input impedance and shall be kept at the minimum length. The SPD shall be installed in strict accordance with the manufacturer's recommended practices and in compliance with N.E.C. requirements, State, and Local Codes.
- J. If any lead lengths exceed 18", the Contractor responsible for installation must contact the specifying electrical engineer and the surge suppression manufacturer or distributor (888-212-2728) for installation assistance.
- K. The electrical contractor shall verify the proper application of the SPD (i.e., voltage, phases, etc.). The electrical contractor shall ensure that all Neutral conductors are bonded to the system Ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD. The electrical contractor will ensure that neutral-to-ground bonds do not exist at locations that are not service entrances or newly derived power sources.
- L. The electrical contractor shall furnish all labor, materials, equipment, and services necessary for and incidental to the installation of the SPD system components as specified herein.
- M. The electrical contractor shall coordinate with other electrical work as necessary to interface installation of the transient voltage surge suppression systems with other work on the site.
- N. The SPD installation shall be certified by a licensed electrician that the installation is in accordance with the manufacturer's recommendations, applicable electrical code requirements and the requirements of the specification above. Any deficiencies noted shall be corrected by the Contractor. Provide written documentation of this inspection as part of the closeout documentation

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Compare equipment nameplate data for compliance with Drawings and Specifications.
 - 2. Inspect anchorage, alignment, grounding, and clearances.
 - 3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- B. An SPD will be considered defective if it does not pass tests and inspections.

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- C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

- A. Complete startup checks according to manufacturer's written instructions.
- B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.
- C. Energize SPDs after power system has been energized, stabilized, and tested.

END OF SECTION

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 lighting fixtures, lamps, and ballasts.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.
- B. Related Sections:
 - 1. Section 26 07 26 "Wiring Devices" for manual wall-box dimmers LED fixtures/drivers.
 - 2. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multi-pole lighting relays and contactors.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color-rendering index.
- C. HID: High-intensity discharge.
- D. LER: Luminaire efficacy rating.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Emergency lighting units including battery and charger.
 - 3. Ballast, including BF.
 - 4. Energy-efficiency data.
 - 5. Sound Performance Data: For air-handling lighting fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified elsewhere in these specifications - "Diffusers, Registers, and Grilles."
 - 6. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.

7. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

- a. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

- B. Shop Drawings: For nonstandard or custom lighting fixtures. 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. Wiring Diagrams: For power, signal, and control wiring.

- C. Installation instructions.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting fixtures.

2. Suspended ceiling components.

3. Partitions and millwork that penetrate the ceiling or extends to within 12 inches of the plane of the luminaires.

4. Ceiling-mounted projectors.

5. Structural members to which suspension systems for lighting fixtures will be attached.

6. Other items in finished ceiling including the following:

- a. Air outlets and inlets.

- b. Speakers.

- c. Sprinklers.

- d. Smoke and fire detectors.

- e. Occupancy sensors.

- f. Photo-sensors.

- g. Access panels.

- h. Ceiling projector mounts.

- i. Ceiling mounted surveillance cameras.

7. Perimeter moldings.

- B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

- C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.
- D. Field quality-control reports.
- E. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
 - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fixtures: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. LED drivers: 10 for every 100 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. 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.
- C. Comply with NFPA 70.
- D. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
 - 1. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. On-site coordination meetings: Provide three on-site coordination meetings between contractor and authorized lighting manufacturer's representative to review the following:
 - 1. Pre-construction meeting, prior to rough in stage to review control wiring diagrams, control component placement, occupancy sensor location/placement, wiring types and interconnections, locations of racks/panels, and general overview of control system.
 - 2. Mock up review, after completion of mock-up areas to review operation of each area type for correct operation. At this meeting, the general settings, adjustments, and programming shall be documented and implemented.
 - 3. Final operational test shall take place at substantial completion to verify proper operation of entire building and site lighting control systems. Final settings and programming adjustments shall be made to the satisfaction of the engineer and

architect and fully documented for future reference by the owner as required, and included/provided in the final closeout documentation.

1.9 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Sheet Metal Components:
 - 1. Formed from 22 gauge steel unless otherwise indicated.
 - 2. Form and support to prevent warping and sagging.
 - 3. Free of burrs and sharp corners and edges.
 - 4. Cleaned and powder-coated after fabrication
- C. LED fixtures: Comply with UL 1598. L80 Performance for 50,000 hours. Color temperature consistency shall be indistinguishable and the color shift over a five year period shall be less than 0.007 on the CIE 1976 (u',v') diagram, or a 7-step MacAdam ellipse.
- D. Metal Parts: Free of burrs and sharp corners and edges.
- E. Doors, Frames, and Other Internal Access:
 - 1. Spring loaded cam type latches.
 - 2. Gasketed lens frame – fixture to be free of light leakage under operating conditions.
 - 3. Designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.
- F. Diffusers and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: 0.125 inch MINIMUM unless otherwise indicated.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
- G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located 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 and ballast characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. CCT and CRI for all luminaires.

2.3 LED DRIVERS

- A. Ambient temperature ratings shall be -40 deg F minimum, 130 deg F maximum
- B. Power factor: 0.94 or higher
- C. Total Harmonic distortion: <20%
- D. Minimum warranty on drivers 5 years
- E. NRTL certified (UL/CSA/FM)

2.4 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 1. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours of rated lamp life.
 2. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
 3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
 - g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.5 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
 1. Battery: Sealed, maintenance-free, lead-acid type.

2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and non-metallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gauge.
- F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures:
 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
 2. Install lamps in each luminaire.
- B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.
- C. Remote Mounting of Ballasts: Distance between the ballast and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.

D. Lay-in Ceiling Lighting Fixtures Supports:

1. Install ceiling support system wires, independent of the ceiling suspension devices and grid, to all four corners of each fixture.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

E. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

G. Connect wiring according to Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 05 53 "Electrical Identification."

3.3 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.4 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION

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. Exterior LED luminaires.
 - 2. Luminaire-mounted photoelectric relays.
 - 3. Poles and accessories.
- B. Related Sections:
 - 1. Section 26 51 00 "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

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. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of luminaire.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of luminaire.
 - 4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
 - 5. Photometric data and adjustment factors based on laboratory tests, complying with IES LM-79.
 - a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP 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.
 - 6. Wiring diagrams for power, control, and signal wiring.

7. Photoelectric relays.
 8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.
- 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. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.
- D. Delegated-Design Submittal: For luminaire supports.
1. Include design calculations for luminaire supports.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Luminaires.
 2. Structural members to which equipment and luminaires will be attached.
 3. Underground utilities and structures.
 4. Existing underground utilities and structures.
 5. Above-grade utilities and structures.
 6. Existing above-grade utilities and structures.
 7. Building features.
 8. Vertical and horizontal information.
- B. Qualification Data: For testing laboratory providing photometric data for luminaires and their installation requirements.
- C. Product Certificates: For each type of the following:
1. Luminaire.
 2. Photoelectric relay.
- D. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.
- E. Source quality-control reports.
- F. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Lamps: One for every 100 of each type and rating installed. Furnish at least one of each type.
 2. Glass and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
 3. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.
 4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with IEEE C2, "National Electrical Safety Code."
- E. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Package aluminum poles for shipping according to ASTM B 660.
- B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- C. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent pole surface more than 1/4 inch deep. Do not apply tools to section of pole to be installed below ground line.
- D. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.
- E. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
 - 1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
 - 2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
 - 3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
 - 4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. 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. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

- J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- M. Factory-Applied Finish for Steel luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 - 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected from manufacturer's standard catalog of colors.
- N. Factory-Applied Finish for Aluminum luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
 - 3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
 - 4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
 - a. Color: As selected by Architect from manufacturer's standard catalog of colors.
- O. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located 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 and ballast characteristics:

- a. "USES ONLY" and include specific lamp type.
- b. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
- c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
- d. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.
- e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
- f. CCT and CRI for all luminaires.

2.3 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

- A. Structural Characteristics: Comply with AASHTO LTS-4-M.
 - 1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
 - 2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.2 to obtain the equivalent projected area to be used in pole selection strength analysis.
- B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
 - 1. Materials: Shall not cause galvanic action at contact points.
 - 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
 - 3. Anchor-Bolt Template: Plywood or steel.
- D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.
- E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."
- F. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.
- G. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.

2.4 STEEL POLES

- A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig; one-piece construction up to 40 feet in height with access handhole in pole wall.
 - 1. Shape: Square, straight.
 - 2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.
- B. Steel Mast Arms: Type as shown/called for on the plans, continuously welded to pole attachment plate. Material and finish same as pole.
- C. Brackets for Luminaires: Detachable, cantilever, without underbrace.
 - 1. Adapter fitting welded to pole, allowing the bracket to be bolted to the pole mounted adapter, then bolted together with stainless-steel bolts.
 - 2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
 - 3. Match pole material and finish.
- D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- E. Steps: Fixed steel, with nonslip treads, positioned for 15-inch vertical spacing, alternating on opposite sides of pole; first step at elevation 10 feet above finished grade.
- F. Intermediate Handhole and Cable Support: Weathertight, 3-by-5-inch handhole located at midpoint of pole with cover for access to internal welded attachment lug for electric cable support grip.
- G. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.
- H. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.
- I. Platform for Lamp and Ballast Servicing: Factory fabricated of steel with finish matching that of pole.
- J. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.
- K. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.
- L. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove

mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."

2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected by Architect from manufacturer's standard catalog of colors.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

- A. Install lamps in each luminaire.
- B. Fasten luminaire to indicated structural supports.
 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

3.2 POLE INSTALLATION

- A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:
 1. Fire Hydrants and Storm Drainage Piping: 60 inches.
 2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
 3. Trees: 15 feet from tree trunk.
- C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."
- D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
 1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
 2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
 3. Install base covers unless otherwise indicated.
 4. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

- E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
 - 1. Dig holes large enough to permit use of tampers in the full depth of hole.
 - 2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.
- F. Embedded Poles with Concrete Backfill: Set poles in augered holes to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
 - 1. Make holes 6 inches in diameter larger than pole diameter.
 - 2. Fill augered hole around pole with air-entrained concrete having a minimum compressive strength of 3000 psi at 28 days, and finish in a dome above finished grade.
 - 3. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through concrete dome. Arrange to drain condensation from interior of pole.
 - 4. Cure concrete a minimum of 72 hours before performing work on pole.
- G. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch- wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.
- H. Raise and set poles using web fabric slings (not chain or cable).

3.3 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

- A. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified elsewhere in these specifications.

3.4 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 GROUNDING

- A. Ground metal poles and support structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."
 - 1. Install grounding electrode for each pole unless otherwise indicated.
 - 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
- B. Ground non-metallic poles and support structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."
 - 1. Install grounding electrode for each pole.

2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundations.

3.6 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
 1. Verify operation of photoelectric controls.
- C. Illumination Tests:
 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
 - a. IESNA LM-5, "Photometric Measurements of Area and Sports Lighting Installations."
 - b. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
 - c. IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."
 - d. IESNA LM-64, "Photometric Measurements of Parking Areas."
 - e. IESNA LM-72, "Directional Positioning of Photometric Data."
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. **Contractor Qualifications/Certifications: The fire detection and alarm system controls contractor shall hold a permit from the Alabama State Fire Marshal. The fire alarm system contractor shall provide a copy of the State Fire Marshal's permit to the owner and engineer so that the Engineer may review the contractor's qualifications prior to any work taking place. SEE SPECIFICATIONS SECTION 28 31 11, APPENDIX FOR COPY OF STATE REQUIREMENTS FOR FIRE ALARM CONTRACTOR.**
- B. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, new voice evacuation module, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.
- C. The fire alarm system shall comply with requirements of IFC 2015 and NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
- D. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.
- E. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).
- F. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
- G. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.

1.2 SCOPE:

- A. Furnish and install new digital addressable fire alarm system in the new building as shown on the Plans.
- B. Furnish and install new appliances (initiation and notification) and connect to new fire alarm control panel as required.

1.3 ASIC PERFORMANCE:

- A. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
- B. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
- C. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.
- D. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

- E. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.
- F. Where required, two-way telephone communication circuits shall be supervised for open and short circuit conditions.

1.4 BASIC SYSTEM FUNCTIONAL OPERATION

- A. When a fire alarm condition is detected and reported by the system initiating devices, the following functions shall immediately occur:
 - 1. The system alarm LED on the system display shall flash.
 - 2. A local piezo electric signal in the control panel shall sound.
 - 3. A backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
 - 4. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
 - 5. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.

1.5 SUBMITTALS

- A. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
- B. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
- C. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - 2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
 - 3. Show annunciator layout, configurations, and terminations.
 - 4. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
 - 5. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
 - 6. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

1.6 SOFTWARE MODIFICATIONS

- A. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
- B. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system

structure and software shall place no limit on the type or extent of software modifications on-site.

1.7 CERTIFICATIONS

- A. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.8 GUARANTY

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal.

1.9 POST CONTRACT MAINTENANCE

- A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.
- B. As part of the submittal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.
- C. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:
- D. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
- E. Each circuit in the fire alarm system shall be tested semiannually.
- F. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 7.

1.10 POST CONTRACT EXPANSIONS

- A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.
- B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).
- C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.
- D. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

26 65 20 - 4 DIGITAL ADDRESSABLE FIRE ALARM SYSTEM

1.11 APPLICABLE STANDARDS AND SPECIFICATIONS:

- A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.
 - 1. International Building Code 2015
 - 2. International Fire Code 2015
 - 3. National Fire Protection Association (NFPA) - USA:
 - a. No. 13 Sprinkler Systems
 - b. No. 15 Water Spray Systems
 - c. No. 17 Dry Chemical Extinguishing Systems
 - d. No. 72 National Fire Alarm Code
 - e. No. 101 Life Safety Code
 - f. Underwriters Laboratories Inc. (UL) - USA:
 - g. No. 268 Smoke Detectors for Fire Protective Signaling Systems
 - h. No. 864 Control Units for Fire Protective Signaling Systems
 - i. No. 268A Smoke Detectors for Duct Applications
 - j. No. 521 Heat Detectors for Fire Protective Signaling Systems
 - k. No. 464 Audible Signaling Appliances
 - l. No. 38 Manually Actuated Signaling Boxes
 - m. No. 346 Waterflow Indicators for Fire Protective Signaling Systems
 - n. No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling Systems
 - o. No. 1971 Visual Notification Appliances
 - 4. Local and State Building Codes.
 - 5. All requirements of the Authority Having Jurisdiction (AHJ).

1.12 APPROVALS

- A. The system shall have proper listing and/or approval from the following nationally recognized agencies:
 - 1. UL Underwriters Laboratories Inc
- B. The fire alarm control panel shall meet UL Standard 864 (Control Units) and UL Standard 1076 (Proprietary Burglar Alarm Systems).

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Notifier NFS320E or equal by EST or FCI
- B. Substitute equipment proposed as equal to equipment specified shall meet or exceed requirements of this section. For equipment other than that specified proof that such substitute equipment equals or exceeds features, functions, performance, and quality of specified equipment shall be provided. This proof shall be provided by submission of a copy of specification with each copy of the submittals that has had each paragraph marked as either compliant or non-compliant along with a letter from engineering manager or product manager at factory that certifies information presented as either compliant or non-compliant including a detailed explanation of each paragraph identified as non-compliant. In order to ensure that the Owner is provided with a system that incorporates required survivability features, this letter shall also specifically certify that the system is capable of complying with the test requirements of this section.

2.2 CONTROL PANEL HARDWARE

A. Batteries:

1. Sufficient capacity to provide power for entire system upon loss of normal AC power for a period of 24 hours with 15 minutes of alarm signaling at end of this 24-hour period, as required by NFPA 72, Local Systems.

2.3 SYSTEM PERIPHERALS

A. Addressable Devices - General:

1. Provide address-setting means using rotary-decimal switches.
2. Use simple to install and maintain decade-type (numbered 0 to 9) address switches by using standard screwdriver to rotate 2 dials on device to set address. Devices which use binary address set via dipswitch packages, handheld device programmer, or other special tools for setting device address shall not be acceptable.
3. Detectors: Analog and addressable. Connect to fire alarm control panel's Signaling Line Circuits.
4. Addressable Thermal and Smoke Detectors: Provide 2 status LEDs. Both LEDs shall flash under normal conditions, indicating detector is operational and in regular communication with control panel, and both LEDs shall be placed into steady illumination by control panel, indicating alarm condition has been detected. If required, flashing mode operation of detector LEDs can be programmed off via fire control panel program.
5. Fire Alarm Control Panel: Permit detector sensitivity adjustment through field programming of system. Sensitivity can be automatically adjusted by panel on time-of-day basis.
6. Using software in INCC Command Center, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. Detectors shall be listed by UL as meeting calibrated sensitivity test requirements of NFPA 72, Chapter 7.
7. Detectors shall be ceiling-mounted and shall include separate twist-lock base with tamper-proof feature.
8. Following bases and auxiliary functions shall be available:
 - a. Standard base with remote LED output.
 - b. Sounder base rated at 85 dBA minimum.
 - c. Form-C relay base rated 30 VDC, 2.0 A.
 - d. Isolator base.
9. Detectors shall provide test means whereby they will simulate alarm condition and report that condition to control panel. Such test shall be initiated at detector itself by activating magnetic switch or initiated remotely on command from control panel.
10. Detectors shall store internal identifying type code that control panel shall use to identify type of device (ION, PHOTO, THERMAL).

B. Addressable Manual Stations:

1. Manual Fire Alarm Stations: Non-code, non-break glass type, equipped with key lock so they may be tested without operating handle.
2. Operated Station: Visually apparent, as operated, at a minimum distance of 100 feet (30.5 m) from front or side.
3. Stations shall be designed so after actual activation, they cannot be restored to normal

except by key reset.

4. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on cover. The word FIRE shall appear on front of stations in raised letters, 1.75 inches (44 mm) or larger.
 5. Addressable manual stations shall, on command from control panel, send data to panel representing state of manual switch and addressable communication module status.
- C. Intelligent Thermal Detectors: Intelligent addressable devices rated at 135 degrees F (58 degrees C) and have rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. Connect via 2 wires to fire alarm control panel signaling line circuit.
- D. Intelligent Photoelectric Smoke Detectors with CO sensor: Use photoelectric (light-scattering) principal to measure smoke density and shall, on command from control panel, send data to panel representing analog level of smoke density.
- E. Intelligent Ionization Smoke Detectors with CO sensor: Use dual-chamber ionization principal to measure products of combustion and shall, on command from control panel, send data to panel representing analog level of products of combustion.
- F. Intelligent Duct Smoke Detectors:
1. In-Duct Smoke Detector Housing: Use on-board intelligent photoelectric detector, which provides continuous analog monitoring and alarm verification from panel.
 2. When sufficient smoke is sensed, alarm signal is initiated, and appropriate action taken to shut down or change over air handling systems to help prevent rapid distribution of toxic smoke and fire gases throughout areas served by duct system.
 3. Duct Smoke Detectors Mounted Above Ceiling or Otherwise Obstructed from Normal View: Provide with remote alarm indicator.
 4. Each Detector: Install in either supply side or return side duct in accordance with local mechanical code.
- G. Addressable Dry Contact Monitor Modules:
1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
 2. Mount in standard deep electrical box.
 3. IDC Zone: Suitable for Style B operation.
- H. Addressable Dry Contact Monitor Modules:
1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
 2. Mount in 4-inch (102-mm) square, 2-1/8-inch (54-mm) deep electrical box.
 3. IDC Zone: Suitable for Style D or Style B operation.
 4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.
- I. Addressable Dry Contact Monitor Modules:
1. Provide to connect 2 supervised IDC zones of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
 2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box.
 3. IDC Zones: Suitable for Style B operation.
 4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

J. Addressable Control Modules:

1. Provide to supervise and control operation of 1 conventional NAC of compatible, 24-VDC powered, polarized audio/visual notification appliances or UL-listed polarized relays for fan shutdown and other auxiliary control functions.
2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.
3. Control Module NAC: Wire for Style Z or Style Y (Class A/B) with up to 1 amp of inductive signal or 2 amps of resistive signal operation. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
4. Audio/Visual Power: Provide by separate supervised power circuit from main fire alarm control panel or from supervised, UL-listed remote power supply.

K. Addressable Relay Modules:

1. Available for HVAC control and other building functions. Relay shall have 2 Form C sets of contacts that operate in tandem and are rated for a minimum of 2.0 amps resistive or 1.0 amps inductive. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.

L. Isolator Modules:

1. Provide to automatically isolate wire-to-wire short circuits on SLC Class A or Class B branch. Isolator module shall limit number of modules or detectors that may be rendered inoperative by short-circuit fault on SLC loop segment or branch. At least 1 isolator module shall be provided for each floor or protected zone of building. No more than 25 devices shall be connected to 1 isolator module.
2. If wire-to-wire short occurs, isolator module shall automatically open-circuit (disconnect) SLC. When short-circuit condition is corrected, isolator module shall automatically reconnect isolated section.
3. Does not require address-setting, and its operations shall be totally automatic. Not necessary to replace or reset isolator module after normal operation.
4. Mount in standard 4-inch (101.6-mm) deep electrical box or in surface-mounted back box.
5. Single LED: Flash to indicate isolator is operational and illuminate steadily to indicate short-circuit condition has been detected and isolated.

M. Notification appliances

1. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.
2. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
3. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
4. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or

nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum **1-inch**- high letters on the lens.

- a. Rated Light Output:
 - 1) 15/30/75/110 cd, selectable in the field.
 - b. Mounting: Wall mounted unless otherwise indicated.
 - c. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 - d. Flashing shall be in a temporal pattern, synchronized with other units.
 - e. Strobe Leads: Factory connected to screw terminals.
 - f. Mounting Faceplate: Factory finished, red.
5. Voice/Tone Notification Appliances:
- a. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
 - b. High-Range Units: Rated 2 to 15 W.
 - c. Low-Range Units: Rated 1 to 2 W.
 - d. Mounting: semirecessed.
 - e. Matching Transformers: Tap range matched to acoustical environment of speaker location.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer. ***Fire alarm system cabling, where routed above accessible ceilings, may be supported with j-hooks but must be supported separately from other low-voltage cabling.***
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2 TEST

- A. The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.
- B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
- C. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
- D. Verify activation of all waterflow switches.
- E. Open initiating device circuits and verify that the trouble signal actuates.
- F. Open and short signaling line circuits and verify that the trouble signal actuates.
- G. Open and short notification appliance circuits and verify that trouble signal actuates.
- H. Ground all circuits and verify response of trouble signals.
- I. Check presence and audibility of tone at all alarm notification devices.

- J. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
- K. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
- L. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL OBSERVATION

- A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.
- B. Provide NFPA Form 72C Completion Form for the new fire alarm system installation.

3.4 SYSTEM INSTRUCTION

- A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION

PART 1 GENERAL

1.1 TERMS & CONDITIONS

- A. This document covers the provision of an Integrated Security Management System (ISMS) for the including items and subsystems shown on drawings or otherwise required by these specifications.
- B. The requirements of these specifications shall be understood to be the Owner's minimum requirements. The requirements shall be expanded as necessary to ensure quality. However, unless engineer approval is obtained, the requirement herein shall not be deleted or revised.
- C. City of Gadsden shall be hereinafter referred to in this document as the OWNER and the bid respondents shall be referred to as the SECURITY CONTRACTOR. The term OWNER includes direct employees and other appointed OWNER agents such as architects or consultants. These agents may be requested by the OWNER to represent the engineers in undertaking certain project tasks.
- D. If any statement in this or any other specification is in conflict with any provision of the General Terms and Conditions to the contract, the provision stated in the General Terms and Conditions shall take precedence. Any questions that require additional interpretation and guidance shall be immediately brought to the OWNER'S attention

1.2 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NFPA 101 - Life Safety Code.
- C. UL 294 - Access Control Systems.
- D. UL 1076 - Proprietary Burglar Alarm Units and Systems.
- E. American with Disabilities Act - Public Law 101.336
- F. FCC
- G. CE
- H. NIST Triple DES Certificate #206

1.3 RELATED DOCUMENTS

- A. Section 26 01 01 "Basic Electrical Requirements"
- B. Section 26 05 19 "Low-voltage Electrical Power Conductors and Cables"
- C. Section 26 05 26 "Grounding and Bonding for Electrical Systems"
- D. Section 26 05 29 "Hangers and Supports for Electrical Systems"
- E. Section 26 05 33 "Raceways and Boxes for Electrical Systems"

- F. Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling"
- G. Section 26 05 53 "Identification for Electrical Systems"
- H. Section 26 85 00 "Video Surveillance System"
- I. Section 26 90 00 "Structured Cabling System"

1.4 SCOPE OF WORK

- A. The SECURITY CONTRACTOR shall include all necessary wiring, cabling, labor, tools, equipment, and ancillary materials required to furnish and install a complete and operational expansion/ addition to the existing ISMS located at the Intermodal Facility.
- B. Requirements are indicated elsewhere in these specifications for work including, but not limited to:
 - 1. Conduit, [110/230] VAC power extensions, and other electrical work shall be furnished and installed by a licensed electrical contractor.
 - a. Any/ all required electrical work above 70V shall be furnished and installed under this contract by a licensed electrical contractor.
 - 2. Electric door hardware, sensors, egress devices shall be furnished and installed by others with required connections to controller by this contractor.
 - 3. Associated lock power supplies for card reader doors shall be furnished and installed by SECURITY CONTRACTOR.
 - 4. The Contractor shall arrange for dedicated telephone lines and local area network (LAN) connections as required for connection to the existing ISMS.
- C. The ISMS shall provide management, control, and monitoring of card access and alarms.
- D. The extent of ISMS work is defined to include but not limited to the following:
 - 1. The Existing ISMS database and application host server shall be modified and updated as required for the addition of new peripherals.
- E. Modification of the existing ISMS and bringing it to operational status for acceptance shall include but not limited to the following:
 - 1. Determine hardware, software, and operations requirements for implementation.
 - 2. Update/ expand ISMS hardware and software.
 - 3. Setup and configure communications between the host server and control panels.
 - 4. Modify and configure existing ISMS application and database.
 - 5. Test ISMS operations based on a point-by-point walkthrough inspection.
 - 6. Perform end-user training.
- F. Special instructions
 - 1. Contractor shall coordinate exact location, height and cable/ raceway routing for all new equipment with owner, architect and owner's security department prior to roughing.
 - 2. All card readers and door contacts shall be flush mounted and shall be suitable for the environment in which they are installed.
 - 3. All raceways and cabling shall be concealed in walls or above ceiling. Where finishes are disturbed, contractor shall repair/ replace surfaces to match original at no additional expense to owner.
 - 4. Any/ all exposed raceway/ conduit (where allowed in ceiling areas with exposed structure) shall be painted to match adjacent surface.

5. Any/ all ceiling tiles damaged/ soiled during installation shall be replaced at no additional cost to owner.
6. This security contractor shall be responsible for the coordination and arrangement of all power required for any equipment included in this contract. All work performed for circuits/ equipment requiring greater than 70V shall be done by the electrical contractor.
7. All roof penetrations shall be kept to an absolute minimum. Security contractor shall coordinate with the roofing consultant and roofing contractor for all roof penetrations. No roof penetrations shall be permitted that would void the roof warranty.
8. Mullion-mounted card readers may be acceptable in specific locations if approved by owner.
9. Security contractor shall provide redundant power supplies on all servers.
10. Contractor shall coordinate with electrical contractor for provision of all 120v power at all locations where required. Contractor shall furnish and install all control power transformers for equipment as required.
11. Contractor shall in no way perform any work or make any penetrations that might compromise the integrity of the safe space/ shelter area.
12. Contractor shall furnish and install all brackets, hardware and environmentally appropriate enclosures as required for all equipment. Contractor shall furnish and install wire guards for all equipment mounted in gymnasium.
13. Contractor shall review and maintain all fire ratings.
14. Coordinate conduit stub/ termination with architect where ceilings do not exist.
15. Each door contact associated with a door/ leaf will require a dedicated input on the access control system.
16. Fire alarm system shall be monitored by access control system. Secondary fire alarm system reporting shall be provided through access control system. Coordinate with fire alarm contractor for required connections to fire alarm system to allow secondary reporting via the access control system. Security contractor shall furnish and install cabling and connections as required for secondary fire alarm system reporting via the access control system.
17. Access control system shall monitor utility power and report any/ all interruptions/ outages of utility power to owner's security department central command center.
18. Each Comm room/ MDF/ IDF shall be equipped with an intelligent controller/ access control panel.
19. In all locations where mag-locks are used, connect door controller/ power supply directly to fire alarm control panel to allow free egress at door during a fire alarm public notification event

1.5 SUBMITTALS

- A. Submittals shall ensure that all parties involved can determine that the proposals meet the ISMS requirements as specified.
 1. Executive Summary System Description: Descriptive statement and single-line block diagram to show how all related equipment will interface and operate as a complete ISMS.
 2. Product Data: Manufacturer's technical data sheets on each product to be used.
 3. Shop Drawings: Provide complete shop drawings that include the following:
 - a. Point-to-Point diagram of all system device locations on architectural floor plans; no other system(s) shall be included on these plans.
 - b. Detailed schematic wiring diagrams for all system devices. Wiring information shall include cable type, conductor routings, quantities, and connection details at devices.
 4. Manuals: Manufacturer's user's manuals for operations, administration, installation, and maintenance.
 5. Web-based Training: Access to web based training modules.

6. Software: 1 set of fully functional ISMS software in manufacturer's original media packaging, temporarily licensed for a (30) day evaluation period.

B. Contract Close-Out Submittals:

1. Training Course Materials: Specified elsewhere in this document.
2. Commissioning Test Plan and Check-Off List: Specified elsewhere in this document.
3. As-Built Drawings: During system installation, the SECURITY CONTRACTOR shall maintain a separate hard copy set of drawings, elementary diagrams, and wiring diagrams of the ISMS to be used for record drawings. This set shall be kept up to date, reflecting all changes and additions made to the ISMS. Copies of the final as-built drawings shall be provided to the owner in DXF format using the latest version of AutoCAD.

1.6 WARRANTY AND MAINTENANCE

- A. The ISMS software, hardware, and installation shall be warranted against defects and workmanship for a minimum of (12) months, covering all parts and labor, after acceptance by OWNER.
- B. The SECURITY CONTRACTOR shall guarantee that the ISMS application software/firmware remains current at all times with the latest enhancements, and is supported by the ISMS manufacturer with unlimited remote dial-in diagnostics capability and technical phone support.
- C. The SECURITY CONTRACTOR shall perform manufacturer's recommended preventative maintenance on all applicable components and/or devices.
- D. The SECURITY CONTRACTOR shall be the primary contact and respondent for all service and support and officially recognized and backed by the ISMS manufacturer.
- E. Extended and/or out of warranty terms at reasonable and customary rates shall be available from the SECURITY CONTRACTOR.
- F. Include in contract sum, extended warranty and maintenance service after acceptance by Owner.
 1. Initial Warranty and Maintenance Service Extended to one year.
- G. Provide a separate proposal for an extended warranty and maintenance service contract for consideration by OWNER.
 1. Length of Contract: Five years
 2. Submit payment terms and conditions with proposal.

2.1 MANUFACTURERS

- A. This specification is based on software and hardware manufactured by BLACKBOARD
- B. Substitutions: Any proposed substitution must be submitted a minimum of 10 days prior to the bid. Any proposed substitution must be fully demonstrated to owner's security department prior to the bid and must FULLY integrate with the existing system-wide Blackboard access control system at the same level as the specified system. Any system or component that has not been demonstrated to the full satisfaction of the owner's security department or has not been deemed acceptable by the owner's security department prior to the bid will not be accepted. The Owner

and architect/ engineer reserves the right to reject and deny any substitution that it may, in its sole discretion, deem unequal, and the findings in this regard shall be accepted by the bidder as final and binding

2.2 HEAD-END EXPANSION AND SOFTWARE MODIFICATION

1. Provide all ISMS access control hardware and software modifications as required for integration of new peripherals into existing system as required.
2. All additional hardware shall match existing system.
3. All existing software shall be upgraded to most recently available version
4. All software modifications shall be compatible with existing system.
5. Provide additional server licenses for additional card readers plus 25% future growth.

2.3 INPUT/OUTPUT DEVICES

A. Card Readers:

1. Reader Technology: As specified by selected card technology; compatible with ISMS control panels and commercially available from industry leading manufactures that include but not limited to:
 - a. GE Security
 - b. HID
 - c. Motorola
 - d. Other pre-approved equals.
2. The readers shall offer multiple models and/or styles to fit various installation and application requirements including:
 - a. Rugged, weatherized enclosures rated for indoor and outdoor mounting.
 - b. Rated for mounting on metal and non-metal surfaces.
 - c. Provide audible and visual indicators for reader status and validation of granted and denied access.
3. Reader shall be as shown on drawings.

- B. Cards: Contractor shall furnish one-hundred (100) cards to be compatible with specified reader. Card type shall be as directed by owner.

3.1 SECURITY CONTRACTOR

- A. The SECURITY CONTRACTOR shall be a local installation and service organization, currently recognized as a factory authorized representative by the manufacturer of the specified system.
- B. The SECURITY CONTRACTOR shall provide a minimum of (3) references whose systems are of similar complexity and have been installed and maintained by the SECURITY CONTRACTOR in the last (5) years.

- C. At time of bid, the SECURITY CONTRACTOR shall be licensed by the state or local jurisdiction to perform security work within the state. Contractors who have security licenses or permits pending shall not be considered acceptable for bidding on this project.
- D. The SECURITY CONTRACTOR shall assure that all personnel working on the project are registered with the state or local jurisdiction Systems Licensing Board as provided for by current state statutes.
- E. At the time of bid, the SECURITY CONTRACTOR shall provide satisfactory evidence of liability insurance and Workmen's Compensation coverage for employed personnel as required by law.

3.2 PROJECT MANAGEMENT

- A. The SECURITY CONTRACTOR shall provide an on-site, factory-trained technician to assist, advise and manage installing personnel.
- B. All of the SECURITY CONTRACTOR'S personnel and operating forces including subcontractors and delivery personnel, shall be made aware of, and shall comply at all times, with the regulations, project requirements, and directions of responsible OWNER personnel.

3.3 PERSONNEL

- A. The SECURITY CONTRACTOR'S personnel shall be qualified to accomplish all work promptly and satisfactorily. The OWNER shall be advised in writing of all designated service and support personnel responsible for installation as well as pre and post warranty service.
- B. The SECURITY CONTRACTOR shall provide proof that designated service and support personnel have successfully completed the appropriate level of both hardware and software training offered by the manufacturer for installation and maintenance of the specified system.

3.4 INSTALLATION

- A. The SECURITY CONTRACTOR shall install all system components and appurtenances in accordance with the manufacturer's specifications, referenced practices, guidelines, and applicable codes. Furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified. Control signal, communications, and data transmission line grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.
- B. All wiring is to be installed in dedicated conduit throughout. Cable shall not be pulled into conduits or placed in raceways, compartments, outlet boxes, junction boxes, or similar fittings with other building wiring.
- C. All low voltage wiring outside the control console, cabinets, boxes, and similar enclosures, shall be plenum rated where required by code.
- D. All wiring conductors connected to terminal strips shall be individually numbered and each cable or wiring group being extended from a panel or cabinet to a building mounted device shall be identified with the name and number of the particular device as identified and shown on building drawings.
- E. All exposed wiring inside and outside the control console, cabinets, boxes, and similar enclosures, shall be dressed down neatly and secured with wiring cleats or wire ties.

- F. All exposed metallic flexible conduit and armored cable shall be dressed down neatly and secured with low profile, metal fasteners.
- G. All cabinets, boxes, and similar enclosures containing security system components and/or cabling and which are easily accessible to employees or to the public shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered to be accessible.
- H. All junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamper proof screws.
- I. End-of-Line resistors shall be installed at the field device location and not at the controller panel location.
- J. System devices identified on building drawings are intended to generally indicate areas where such devices are to be located. Security Contractor shall be responsible for determining final location of these devices in accordance with OWNER'S requirements.
- K. Riser diagrams are schematic and do not show every conduit, wire box, fitting, or other accessories. Provide such materials as necessary for a complete and functioning installation. Install in accordance with referenced codes and these specifications. Use weatherproof equipment or covers where installed in areas exposed to weather.

3.5 COMMISSIONING AND TRAINING

- A. The SECURITY CONTRATOR is required to place entire system into full and proper operation as designed and specified.
 - 1. Verify that all hardware components are properly installed, connected, communicating, and operating correctly.
 - 2. Verify that all system software is installed, configured, and complies with specified functional requirements.
- B. The SECURITY CONTRACTOR shall perform final acceptance testing in the presence of OWNER'S representative, executing a point by point inspection against a documented test plan that demonstrates compliance with system requirements as designed and specified:
 - 1. Submit documented test plan to OWNER at least (14) days in advance of acceptance test, inspection, and check-off.
 - 2. Conduct final acceptance tests in presence of OWNER'S representative, verifying that each device point and sequence is operating correctly and properly reporting back to control panel and control center.
 - 3. Acceptance by Owner is contingent on successful completion of check-off; if check-off is not completed due to additional work required, re-schedule and perform complete check-off until complete in one pass, unless portions of system can be verified as not adversely affected by additional work.
 - 4. The system shall not be considered accepted until all acceptance test items have been successfully checked-off. Beneficial use of part or all of the system shall not be considered as acceptance.
- C. The SECURITY CONTRACTOR shall provide system operations, administration, and maintenance training by factory trained personnel qualified to instruct:
 - 1. OWNER will designate personnel to be trained.

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2. Provide printed training materials for each trainee including product manuals, course outline, workbook or student guides, and written examinations for certification.
3. Provide hands-on training with operational equipment.
4. Training shall be oriented to the specific system being installed under this contract as designed and specified.

END OF SECTION

SECTION 26 90 00

STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 26 01 01 "Basic Electrical Requirements".
- C. Section 26 05 26 "Grounding and Bonding for Electrical Systems".
- D. Section 26 05 29 "Hangers and Supports for Electrical Systems".
- E. Section 26 05 33 "Raceways and Boxes for Electrical Systems"
- F. Section 26 05 44 "Sleeves and Seals for Electrical Raceways and Cabling"
- G. Section 26 05 53" Identification for Electrical Systems"

1.2 SUMMARY

- A. All work under this specification section to be performed by a qualified telecommunications contractor as defined in this section. This includes, but is not limited to, cabling installation, cabling termination, equipment installation, system component labeling, owner coordination, etc. **All work performed by a contractor who does not meet the contractor qualifications as defined in this section will be replaced at no expense to the owner.**
- B. This document describes the products and execution requirements relating to furnishing and installing Telecommunications Cabling at the building. Backbone and horizontal cabling comprised of copper and fiber cabling, and support systems are covered under this document.
- C. The Horizontal (workstation) Cabling System shall consist of 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet as shown on the plans. The cables shall be installed from the Work Area Outlet to the Telecommunications Room location as called for, and routed to the appropriate rack serving that area and terminated as specified in this document.
- D. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the Telecommunications contractor as detailed in this document or as required for a fully functional system as intended.
- E. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document. If the bid documents are in conflict, this specification shall take precedence. Any/ all work called for in this document or the attachment shall be included in the bid price as if called for in both this document and any/ all attachments. The successful vendor shall meet or exceed all requirements for the cable system described in this document

F. Section Includes:

1. Patch cords.
2. Telecommunications outlet assemblies.
3. Horizontal (workstation) cabling and terminations.
4. Cable identification.
5. Cable connecting hardware.
6. Cross-connects.
7. Patch panels.
8. Telecommunications equipment racks, cabinets and enclosures.
9. Cable management system.
10. Optical fiber panels/ enclosures, patch panels and terminations.
11. Backbone cabling.
12. Telecommunications mounting elements.
13. Backboards.
14. Copper cable protection units.
15. Copper cable punch-down blocks.
16. Grounding.
17. Firestopping.

G. Related Requirements:

1. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association (latest edition of applicable sections), all local codes, requirements of authority having jurisdiction, and present manufacturing standards.
2. All materials shall be UL Listed and shall be marked as such. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.
3. All modular jacks, patch cords, patch panels and CAT6 cable performance shall be verified (not just tested) by a third party to be category 6 component and channel compliant.
4. Regulatory References:
 - a. NFPA 70/ NEC (latest edition): National Electrical Code.
 - b. ANSI J-STD-607 (latest edition): Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
 - c. TIA/EIA-606 (latest revision): Administration Standard for Telecommunications Infrastructure.
 - d. UL 969 (latest revision): Marking and Labeling Systems.
 - e. NECA 1 (latest edition): Standard Practice of Good Workmanship in Electrical Construction.
 - f. BICSI TDMM (latest edition): Telecommunications Distribution Methods Manual.
 - g. TIA/EIA-569 (latest edition): Commercial Building Standard for Telecommunications Pathways and Spaces.
 - h. TIA/EIA-568 (latest edition): Cabling Standard.
 - i. All other regulatory references noted in this document.
5. If this document and any of the documents listed above are in conflict, then the more stringent requirement shall apply. The Contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.
6. This document does not replace any code, either partially or wholly. The contractor must be aware of local codes that may impact this project.

H. ALL CABLE/ DEVICE/ FACEPLATE COLORS SHALL BE COORDINATED, IN WRITING, WITH OWNER/ ARCHITECT PRIOR TO ORDERING.

1.3 WORK INCLUDED

- A. The work included under this specification consists of furnishing all labor, equipment, materials, and supplies and performing all operations and setup necessary to complete the installation of this structured cabling system in compliance with the specifications, drawings and applicable codes/ regulatory references. The Telecommunications contractor will provide and install all of the required material to form a complete system whether specifically addressed in the technical specifications or not.
- B. The work shall include, but not be limited to the following:
 - 1. Furnish and install a complete telecommunications wiring infrastructure.
 - 2. Furnish, install, and terminate **ALL** UTP and Optical Fiber cable.
 - 3. Furnish and install all wall plates, jacks, patch panels, punch-down blocks and equipment room patch cords.
 - 4. Furnish and install all required cabinets and/or racks and/ or enclosures as required or as indicated.
 - 5. Perform link or channel testing (100% of horizontal and/or backbone links/ channels) and certification of all components.
 - 6. Furnish test results of all cabling to the owner in electronic (searchable PDF file) and paper format, listed by each closet, then by workstation ID with the close-out documents.
 - 7. Adhere and comply with all requirements of connectivity and cabling manufacturer Certification programs.
 - 8. Provide owner training and documentation.
 - 9. Coordinate with the owner and the engineer for the required telecom room and equipment identification, conduit routes and identifications, cable identification (at the rack and at the work area). Provide and install labeling for all cables using the owner approved labeling scheme.
 - 10. Furnish any other material required to form a complete system.

1.4 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. LAN: Local Area Network.
- C. CLAN: Campus Local Area Network.
- D. RCDD: Registered Communications Distribution Designer.
- E. EF: Entrance facility.
- F. ER: Equipment Room.
- G. MDF: Facility Main Distribution Frame. May include the Entrance Facility equipment and/ or the Equipment Room equipment.
- H. IDF: Intermediate Distribution Frame.
- I. EMI: Electromagnetic Interference.
- J. Cross-connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

- K. IDC: Insulation Displacement Connector.
- L. UTP: Unshielded Twisted Pair.
- M. Consolidation point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
- N. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/ connectors.
- O. Outlet/ connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
- P. WAP: Wireless Access Point

1.5 HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/ connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.
 - 1. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
 - 2. Bridged taps and splices shall not be installed in the horizontal cabling.
 - 3. Splitters shall not be installed as part of the optical fiber or copper cabling system (excluding coaxial cable).
- B. A work area is approximately 100 sq. ft., and includes the components that extend from the telecommunications outlet/connectors to the station equipment.
- C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet of patch cord to the workstation equipment or in the horizontal cross-connect.

1.6 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications department and LAN equipment and service suppliers.
- B. Coordinate telecommunications outlet/ connector locations with location of power receptacles at each work area.
- C. Coordinate typical labeling configuration with owner in writing prior to implementing.
- D. Coordinate cable pathway routings with electrical contractor and all other trades.

1.7 SUBMITTALS

- A. Contractor shall provide 7 hard copies and an electronic copy (searchable PDF file) of all submittal data required including Product Data, Shop drawings, Informational submittals and samples. Submittals will not be reviewed until complete Structured Cabling submittal package is received.

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- B. The Structured Cabling contractor shall check all suppliers' submittals regarding measurements, capacity, performance and details to satisfy him/ herself that they conform to the intent of the contract drawings and specifications. Submittals package shall bear the stamp of approval of the Structured Cabling contractor as evidence that the submittals have been checked by him/ her. Submittals will not be reviewed without the Structured Cabling contractor's stamp.
- C. See Section 26 01 01 for additional submittal requirements.
- D. Product Data: For each type of product including but not limited to: Patch cords, jacks, faceplates, cables, patch panels, racks/ cabinets
 - 1. Work shall NOT proceed without the engineer's approval of the submitted items.
 - 2. For all cable types used include:
 - a. Performance characteristics.
 - b. Nominal outside diameter.
 - c. Minimum bending radius.
 - d. Maximum pulling tension.
 - 3. For all racks/ cabinets and associated accessories include:
 - a. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
 - b. Rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- E. Shop Drawings:
 - 1. Submit a typical outlet assembly and labeling configuration.
 - 2. System Labeling Schedules:
 - a. Systems Labeling Schedule method shall be approved by owner, in writing, prior to implementation.
 - b. Provide a typical Systems Labeling Schedule sampling with submittals.
 - 3. Cabling administration drawings and printouts.
 - 4. Wiring diagrams to show typical wiring schematics including the following:
 - a. Cross-connects.
 - b. Patch panels (copper and fiber)
 - c. Patch cords and jumpers.
 - d. Work area outlet.
 - e. Active network equipment.
 - 5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
 - 6. Cable pathway layout, showing raceway route and type (cable tray, J-hooks, conduit, sleeves and pullboxes) to scale, with relationship between the pathway and adjacent structural, electrical, and mechanical elements. Include the following:
 - a. Vertical and horizontal offsets and transitions.
 - b. Clearances for access above and to side of cable trays and J-hook pathway.
 - c. Vertical elevation of pathway above the floor or bottom of ceiling structure.

- d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray/ J-hooks and support elements.
 - e. Load calculations to show dead and live loads as not exceeding manufacturer's rating for conduit support elements.
- 7. Detail equipment assemblies and indicate dimensions, weights, loads, recommended clearances, method of field assembly, components, and location and size of each field connection.
- 8. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
- 9. Grounding: Submit a scale drawing of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.
- 10. Contractor shall include in the submittal package 1-1/2" scale equipment rack elevations (front) for all equipment racks/ cabinets. Elevations must include and identify (by manufacturer and model# where applicable) the following:
 - a. Individual equipment rack identification
 - b. All rack-mounted equipment
 - c. All rack-mounted cable management
 - d. All rack-mounted Power Distribution Units
 - e. All rack-mounted ground bars
 - f. All blank filler plates
 - g. All rack mounted Uninterruptable Power Supplies (UPS)
- 11. Contractor shall include in the submittal package 1/2" scale drawings of each telecom room. Drawings must include and identify (by manufacturer and model# where applicable) the following:
 - a. All equipment rack(s) and clearances.
 - b. All backboard(s).
 - c. All cable tray/ cable runway.
 - d. Wall mounted ground bar.
 - e. All raceway penetrations.
 - f. All riser conduits.
 - g. All punch-down blocks.
 - h. All floor or wall-mounted Uninterruptable Power Supplies (UPS).
 - i. Receptacle locations.
 - j. All fire-stopping material/ fittings
 - k. All other equipment indicated on drawings or existing (where applicable).
- 12. Contractor shall include in the submittal package 1/2" scale interior elevations of all walls in each Comm room. Elevations must include and identify (by manufacturer and model# where applicable) the following:
 - a. All backboards.
 - b. All wall mounted equipment.
 - c. All raceway penetrations.
 - d. All riser conduits.
 - e. All wall mounted cable management (D-rings).
 - f. All backbone cabling.
 - g. All receptacles.
 - h. All punch-down blocks.
 - i. Wall mounted ground bar(s).
 - j. All fire-stopping material/ fittings.

F. INFORMATIONAL SUBMITTALS

1. The following informational submittal information must be provided with the submittal package:

- a. Qualification Data: For all telecommunications contractor's personnel on site, qualified layout technicians, installation supervisor, Installers, telecommunications contractor's field quality inspector and RCDD. Personnel qualification data shall include all BICSI certifications as well as all current cabling/ connectivity manufacturer's certifications.
 - 1) Contractor shall submit names of all personnel to be performing work related to this project
 - 2) Contractor shall submit a copy of the current cabling/ connectivity manufacturer's certification documents for all contractor personnel to be involved with this project.
 - 3) Contractor shall submit a copy of all BICSI certification documents for all contractor personnel to be involved with this project.
- b. Seismic Qualification Certificates: For equipment frames 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. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
 - 3) Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- c. Contractor must submit the following information regarding the 3 projects of similar size and scope (see "Quality Assurance"):
 - 1) Project name.
 - 2) Project location.
 - 3) Project owner. Include contact information (name, address, telephone and e-mail) for owners IT department or responsible party as it relates to structured cabling.
 - 4) Approximate value of project structured cabling.
 - 5) Approximate drop count.
 - 6) Contact information (including name, address, telephone and e-mail) of electrical or general contractor directly responsible for the structured cabling subcontractor.
- d. Contractor must submit a sample of the labeling system for all outlets, cables and patch panels.

G. Samples: jacks, jack assemblies, icons, cable (1 foot section), patch cable (3 foot length) and faceplate. Provide one of each type and size of each product submitted.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance data: For splices and connectors to include in maintenance manuals.
- B. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On magnetic media or compact disk, complete with data files.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

- C. System Labeling Schedules: Electronic copy of labeling schedules in searchable PDF file format.
- D. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
- E. All testing records.
- F. All as-built drawings.
- G. All warranty materials.
- H. Other records as called for within this specification.

1.9 MAINTENANCE SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Patch cables: Ten of each length used.
 - 2. Jacks: Ten of each type used.
 - 3. Faceplates: Two of each type/ port capacity used.
 - 4. 4 pair UTP Cable: One 500ft reel of each type used.
 - 5. Patch-Panel units: One of each type used.
 - 6. Rack filler panels: One of each type used.
 - 7. Power distribution units: One of each type used.
 - 8. Punch-down blocks: One of each type used.

1.10 QUALITY ASSURANCE

- A. Installer Qualifications: The successful telecommunications contractor shall be a company specializing in communication cabling installation and shall have been in business for a minimum of 5 years under the same name and with the same board of directors/ management. Contractor must have successfully completed a minimum of 3 projects of similar size and scope within the last 5 years. At least 30 percent of the copper installation and termination crew must be certified by BICSI **and** the cable/connectivity manufacturer with a Technicians Level of Training. At least 10 percent of the optical fiber installation and termination crew must be certified by BICSI **and** the fiber cable/ connectivity manufacturer in optical fiber installation and termination practices. The contractor must have an RCDD on staff in responsible charge of the project. Provide all contact information for the RCDD as this will be the point of contact for the project.
 - 1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of an RCDD.
 - 2. Installation Supervision: Installation shall be under the direct supervision of a BICSI certified Commercial Installer, Level 2, who shall be present at all times when work of this Section is performed at Project site.
 - 3. Contractor's field quality inspector shall be the RCDD who is in responsible charge of the project or the on-site installation supervisor. **Contractor's field quality inspector shall provide biweekly on-site inspection reports to the engineer documenting this discipline's project progress.** These reports shall be submitted to adam@eegrpinc.com. Report shall include work that has been completed, work that is in progress, work remaining and estimated date of completion for each phase of work for

the project. Report shall include photographs of completed work and work in progress. Report shall include telecommunications contractor's personnel on-site for the duration of time included in the report.

4. Structured cabling contractor shall have, on site for final inspection, the RCDD who is in responsible charge of the project or the on-site installation supervisor. If one of the requested personnel is not present at the final inspection, the structured cabling contractor will be charged for time (\$125.00/ hour) and mileage (\$0.56/ mile) for the Jack R. Morgan Engineering, Inc. representative for the missed inspection. This charge must be paid prior to any subsequent visits to the site.
 5. Testing supervisor shall be currently certified by BICSI as an RCDD and shall be on-site to supervise all testing.
- B. The cabling/ connectivity manufacturer shall extend a manufacturer's warranty for all products installed, this project, to the end user once the telecommunications contractor fulfills all requirements under this specification. See section 3 of this document for full warranty requirements.
 - C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
 - E. Grounding: Comply with ANSI-J-STD-607-A.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and receipt of products shall be at the site.
- B. Cable shall be stored according to manufacturer's recommendations at a minimum. In addition, cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 40 degrees F., the cable shall be moved to a heated (50 degrees F. minimum) location. If necessary, cable shall be stored off site at the contractor's expense.
- C. If the telecommunications contractor wishes to have a trailer on site for storage of materials, arrangements shall be made with the Owner.
- D. Test all cables upon receipt at Project site.
 1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
 2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in closeout submittals.
 3. Test each pair of UTP cable for open and short circuits.

1.12 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install ANY cables or connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.13 DRAWINGS

- A. It shall be understood that the electrical details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the telecommunications contractor in bidding the job. The telecommunications contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications and provide a fully functional system as intended.
- B. The telecommunications contractor shall verify all dimensions at the site and be responsible for their accuracy.
- C. Prior to submitting the bid, the telecommunications contractor shall call the attention of the Engineer to any materials or apparatus the telecommunications contractor believes to be inadequate and to any necessary items of work omitted.

PART 2 - PRODUCTS

2.1 EQUIVALENT PRODUCTS

- A. Due to the nature and type of communications all products, including but not limited to faceplates, jacks, patch panels, racks, punch-down blocks, and patch cords, for the purpose of this document, shall be manufactured by Leviton. All copper cable products shall be manufactured by Berktek. All fiber cable products shall be manufactured by Corning.

2.2 TELECOMMUNICATIONS OUTLET/CONNECTORS (CAT6)

- A. Work area cables shall each be terminated at their designated work area location in the connector types specified on drawings/ described in the subsections below. Included are modular telecommunication jacks. These connector assemblies shall snap into a faceplate.
- B. The Telecommunications Outlet Assembly shall accommodate a minimum of two (2) modular jacks plus any additional accommodations for specific locations as noted in the plans for optical fiber and/or additional copper cables as necessary
- C. A blank filler will be installed when extra ports are not used.
- D. A dust cap shall be provided on all modular jacks with the circuit number on the identifier strip.
- E. Multiple jacks that are identified in close proximity on the drawings (but not separated by a physical barrier) may be combined in a single assembly. The telecommunications contractor shall be responsible for determining the optimum compliant configuration based on the products proposed.
- F. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation. Prior to installation, the telecommunications contractor shall submit the proposed configuration for each outlet assembly for review by the owner.
- G. The modular jack shall incorporate printed label strip on the dust cap module for identifying the outlet. Printed labels shall be permanent and compliant with ANSI/TIA/EIA-606-A standard specifications. Labels shall be printed using standard connectivity manufacturer's label program or using a printer such as a Brady hand held printer. **Hand printed labels shall NOT be accepted.**

H. Workstation Outlets shall be as specified on drawings with connector and faceplate.

1. Jacks shall:

- a. Be 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.
- b. Meet category 6 performance as defined by the references in this document including ANSI/TIA/EIA-568-B.2-1. All pair combinations must be considered, with the worst-case measurement being the basis for compliance. Modular jack performance shall be third-party verified by a nationally recognized independent testing laboratory.
- c. Use dual reactance modular contact array.
- d. Have low emission IDC contacts.
- e. Use standard termination practice using 110 impact tool.
- f. Be backwards compatible to Category 3, 5, and 5e.
- g. Be center tuned to category 6 test specifications.
- h. Dust covers shall be used on each termination.
- i. Be as specified on drawings. Jack and icon color to be selected by owner/architect.

2. Faceplate shall:

- a. Be as manufactured by connectivity manufacturer.
- b. Be UL listed and CSA certified.
- c. Be available in single-gang or dual-gang.
- d. Shall provide easy access for adds, moves, and changes by front removal of jack modules.
- e. Possess recessed designation windows to facilitate labeling and identification.
- f. Shall include a clear plastic cover to protect labels in the designation window.
- g. Have mounting screws located under recessed designation windows.
- h. Comply with ANSI/TIA/EIA-606-A work area labeling standard.
- i. Allow for the UTP modules to be inverted in place for termination purposes.
- j. Be manufactured by an ISO 9001 registered company.
- k. Be compliant with the above requirements along with the following when incorporating optical fiber:
 - l. Be a low profile assembly,
- m. Incorporate a mechanism for storage of cable and fiber slack needed for termination,
- n. Position the fiber optic couplings to face downward or at a downward angle to prevent contamination.
- o. Incorporate a shroud that protects the fiber optical couplings from impact damage.
- p. Be Stainless steel as specified on drawings and complying with requirements in section 26 27 26.
- q. For use with snap-in jacks accommodating any combination of UTP, optical fiber and coaxial work area cords.
- r. Flush mounting jacks.
- s. Shall have window for snap-in, clear-label covers and machine-printed paper inserts.

2.3 UTP CABLE (CAT6)

- A. Subject to compliance with requirements, provide product indicated on drawing.
- B. UTP cable shall be as manufactured by Berktek

C. Performance:

1. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.
2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 50 or less.
3. 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.
4. Grounding: Comply with J-STD-607-A.

D. Description: 100-ohm, four-pair UTP, covered with a thermoplastic jacket shall:

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Be listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, General Purpose: CMP or CMR.
 - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
 - c. Communications, Riser Rated: Type CMR, complying with UL 1666.
5. Be plenum rated and meet applicable requirements of ANSI/ICEA S-80-576 in all locations where the cable path crosses any space rated as a return air plenum. All 4 pairs must be insulated with F.E.P. No constructions that use mixed insulation materials for a single cable pathway will be allowed.
6. Consist of (4) 23 AWG twisted pairs.
7. Be suitable for the environment in which they are to be installed.
8. Have an overall diameter no larger than 0.250 inches.
9. Have an ultimate breaking strength measured in accordance with ASTM D 4565 and shall be no less than 400 N minimum.
10. Shall withstand a bend radius of 1 inch at -20 degrees Celsius without jacket or insulation cracking.
11. Be third party verified to meet ANSI/TIA/EIA-568-B.2.
12. Shall be color coded as required to meet owners color coding scheme.
13. Be as specified on drawings.

2.4 UTP CABLE HARDWARE (CAT6)

- A. Subject to compliance with requirements, provide product indicated on drawing.
- B. UTP cable hardware shall be as manufactured by Leviton
- C. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

- D. Connecting Blocks: 110-style IDC for Category 5e and Category 6. Provide blocks for the number of cables terminated on the block, plus 10 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- E. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- F. Patch Panel shall:
 - 1. House multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
 - 2. Have number of Jacks required to provide one for each four-pair UTP Data and Voice cable indicated plus 10 percent spare.
 - 3. **Have Data, Voice, Building automation and security related cables terminated on separate patch panels.**
 - 4. meet category 6 component compliance and be verified by a third-party nationally recognized independent testing laboratory
 - 5. Use low emission IDC contacts
 - 6. Use dual reactance technology to enhance the signal-to-noise ratio
 - 7. Require standard termination practices using a 110 impact tool
 - 8. Use a single piece IDC housing designed to accept larger Category 6 conductors
 - 9. Support both T568B and T568A wiring
 - 10. Include easy to follow wiring labels
 - 11. Include label fields
 - 12. Allow for the use of icons
 - 13. Include full length metal rear cable management
 - 14. Be available in standard or high density
 - 15. Be backward compatible to category 3, 5 and 5e
 - 16. Be center tuned to category 6 test specifications
 - 17. Be accompanied by horizontal cable management in a ratio of one rack unit of wire management per 24 ports of patch panel.
 - 18. Be as specified on drawings.
- G. Copper Patch Cords:
 - 1. Patch Cords shall:
 - a. Be factory-made, four-pair cables in standard lengths; terminated with eight-position modular plug at each end.
 - b. Have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
 - c. Have color-coded boots for circuit identification.
 - d. Use 8 position connector with impedance matched contacts and designed using dual reactance.
 - e. Be constructed of 100 ohm, 4 pair, 24 AWG, stranded conductor, unshielded twisted pair copper per the requirements of the ANSI/TIA/EIA-568-B.2 and ANSI/TIA/EIA-568-B.2-1 standard.
 - f. Meet TIA category 6 component specifications in ANSI/TIA/EIA-568-B.2-1
 - g. Be 100% factory tested to meet category 6 performance
 - h. Have ETL or any other nationally recognized 3rd party verification
 - i. Be center tuned to category 6 performance specifications by using paired bi-level contact array
 - j. Be capable of universal T568A or T568B wiring schemes

- k. Have a connector that maintains the paired construction of the cable to facilitate minimum untwisting of the wires.
 - l. Have a performance marking indelible label on the jacket (by the manufacturer).
 - m. Have the ability to accept color-coded labels and icons to comply with ANSI/TIA/EIA-606A labeling specifications.
 - n. Have "snag-less" protection for the locking tab to prevent snagging and to protect locking tab in tight locations and provide bend relief
 - o. Be available in three standard colors
 - p. Be backwards compatible to Category 3, 5, and 5e
 - q. Be manufactured by a ISO 9001 registered company.
 - r. Be color coded as directed by owner.
 - s. Be as manufactured by submitted cable or connectivity manufacturer.
 - t. The contractor shall not be required to provide patch cords for voice work area outlets.
2. Cross-connect copper Patch Cords: Factory-made, four-pair, category 6 cables in lengths as required; terminated with eight-position modular plug at each end. Equipment room cross connect patch cables shall be 12" in length
- a. Contractor shall provide one each patch cord for each Data and Voice cable terminated in telecom room. Cables shall be furnished in lengths as required to facilitate a neat and flexible installation.
3. Cross-connect fiber patch cords: factory made, single pair, multimode, 50/125 micrometer, or singlemode in lengths as required, terminated with type LC or MTP connectors. Verify connector type with owner prior to ordering.

2.5 COAXIAL CABLE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
- 1. Superior Essex.
 - 2. Belden Inc.
 - 3. CommScope, Inc.
- B. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.
- C. RG-11/U: NFPA 70, Type CATV.
- 1. No. 14 AWG, solid, copper-covered steel conductor.
 - 2. Gas-injected, foam-PE insulation.
 - 3. Quad shielded with 100 percent aluminum polyester tape and minimum 60 percent aluminum braid.
 - 4. Jacketed with sunlight-resistant, black PVC or PE.
 - 5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.
- D. RG-6/U: NFPA 70, Type CATV or CM.
- 1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
 - 2. Quad shielded with 100 percent aluminum-foil shield and minimum 60 percent aluminum braid.
 - 3. Jacketed with black PVC or PE.
 - 4. Suitable for indoor installations.

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- E. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:
 - 1. CATV Cable: Type CATV, or CATVP or CATVR.
 - 2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
 - 3. CATV Riser Rated: Type CATVR; or CATVP, CATVR, or CATV, complying with UL 1666.
 - 4. CATV Limited Rating: Type CATVX.

2.6 COAXIAL CABLE HARDWARE

- A. Subject to compliance with requirements, provide product indicated on drawing.
- B. Coaxial-Cable Connectors: Type BNC, 75 ohms; Type F, 75 ohms.

2.7 COPPER CABLE PROTECTION UNITS

- A. All copper circuits shall be provided with protection for any/ all copper cabling that penetrates the building envelope (including exterior wall mounted cameras, WAPs or data outlets). The protector shall be connected with a #4 AWG copper bonding conductor between the protector ground lug and the structured cabling ground point. Protector modules shall be housed in connector with cover and splice chamber and shall contain punch-down blocks of same style as specified elsewhere. Enclosure shall be consistent with the environment in which it is installed. Protector must be installed within 50ft of the building envelope penetration.
 - 1. Copper cable protection modules for Digital voice, Data and Security cabling shall be Circa# 4B1FS-240 or equal.
 - 2. Copper cable protection modules for P.O.T.S, Fire Alarm System and paging cabling shall be Circa# 4B1E or equal.

2.8 PATHWAYS

- A. Subject to compliance with requirements, provide product indicated on drawing.
- B. General Requirements: Comply with TIA/EIA-569-A.
- C. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 2. Lacing bars, spools, J-hooks, and D-rings.
 - 3. Straps and other devices.
- D. Cable Trays:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cablofil Inc.
 - b. Cooper B-Line, Inc.
 - c. WBT

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2. Cable Tray Material: Metal, suitable for indoors, and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inches (0.012 mm) thick.
 - a. Basket Cable Trays: 12 inches wide and 4 inches deep. Wire mesh spacing shall not exceed 2 by 4 inches.
 - b. Ladder Cable Trays: Nominally 24 inches wide, and a rung spacing of 8 inches.
 - c. Solid-Bottom Cable Trays: One-piece construction, nominally 12 inches wide. Provide with solid covers in locations with exposed structure.
- E. Conduit and Boxes: Comply with requirements in Section 26 05 33.
 1. Outlet boxes shall be no smaller than 4 inches wide, 4 inches high, and 2-1/2 inches deep.

2.9 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches sheets to cover area indicated on drawings.

2.10 EQUIPMENT FRAMES

- A. Subject to compliance with requirements, provide product indicated on drawing.
- B. General Frame Requirements:
 1. Equipment racks/ cabinets shall provide vertical cable management and support for the patch cords at the front of the rack and wire management, support, and protection for the horizontal cables inside the legs of the rack. Waterfall cable management shall be provided at the top of the rack for patch cords and for horizontal cables entering the rack channels for protection and to maintain proper bend radius and cable support. Horizontal Wire management shall also be mounted above and below each patch panel and/or piece of equipment on the rack at a ratio of 1 rack unit of horizontal cable management per each rack unit of patching or equipment or 1 rack unit of horizontal cable management per 24 ports of patching or active network equipment (whichever is greater). The rack shall include mounting brackets for cable tray ladder rack/ cable runway to mount to the top of the rack. Velcro cable ties shall be provided inside the rack channels to support the horizontal cable. Rack shall be black in color to match the patch panels and cable management. Contractor shall provide complete dimensioned rack assembly details showing all components including part numbers as called for in as built drawings submittals section of this document.
 2. Distribution Frames: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
 3. Module Dimension: Width compatible with EIA 310-D standard, 19-inch panel mounting.
 4. Finish: Manufacturer's standard, baked-polyester powder coat.
- C. Floor-Mounted Racks shall:
 1. Be modular type steel construction. vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug and PDU.
 2. Have Baked-polyester powder coat finish.

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3. Provide the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-B.
4. Have top cable trough with waterfall and built in patch/ horizontal cable distribution separator.
5. Have EIA hole pattern on front and rear.
6. Provide floor and ceiling access for cable management and distribution.
7. Provide pre-drilled base for floor attachment of rack.
8. Be available in standard color of black.
9. Be manufactured by an ISO 9001 registered company.
10. Be furnished with manufacturer's grounding kit.
11. Use blank panels where required

D. Modular Freestanding Cabinets shall:

1. Have removable and lockable side panels.
2. Have hinged and lockable front and rear doors.
3. Have adjustable feet for leveling.
4. Have screened ventilation openings in the roof and rear door.
5. Provide cable access provisions in the roof and base.
6. Have grounding bus bar.
7. Have integral, 550-cfm fan with filter.
8. Provide the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-B.
9. Have top cable trough with waterfall and built in patch/ horizontal cable distribution separator.
10. Have EIA hole pattern on front and rear.
11. Provide floor and ceiling access for cable management and distribution.
12. Provide pre-drilled base for floor attachment of rack.
13. Be available in standard color of black.
14. Be manufactured by an ISO 9001 registered company.
15. Be furnished with manufacturer's grounding kit.
16. Use blank panels where required
17. Baked-polyester powder coat finish.
18. All cabinets keyed alike.

E. Cable Management for Equipment Frames:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each.

2.11 POWER DISTRIBUTION UNITS

A. Power Distribution Units shall:

1. Comply with UL 1363.
2. Be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Be rack mounted.
4. LED indicator lights for power and protection status.
5. LED indicator lights for reverse polarity and open outlet ground.

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6. Be provided in each rack/ cabinet as required to provide one 5-20R outlet for each 24 cables terminated at the rack.
7. Shall NOT have on/ off switch.
8. Have integral amp/ current meter.
9. Have integral surge suppression with a minimum rating of 26 kA.
10. Surge suppression protection modes shall be line to neutral, line to ground, and neutral to ground. UL 1449 clamping voltage for all three modes shall be not more than 330 V.

B. Vertical Power Distribution Unit

1. The vertical power distribution unit shall be equipped with a minimum of ten (10) 3-prong, NEMA 5-20R, 120 VAC outlets, 10' cord.
2. The vertical power distribution unit shall be equipped with surge protection with a 20 Amp current limit.
3. The vertical power distribution unit shall be equipped with a bracket that enables it to be mounted on a 19" rack, cabinet or wall mount bracket without modification.

2.12 **GROUNDING**

- A. The facility shall be equipped with a Telecommunications Bonding Backbone (TBB) furnished and installed by the electrical contractor. This backbone shall be used to ground all telecommunications cable shields (where applicable), equipment, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current carrying conductor.
- B. Each distribution frame location (backboard location) shall be equipped with a telecommunications ground bus bar (TGB). Each TGB shall be connected to the building electrical entrance grounding facility with #3 AWG in 1"C. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between telecommunications equipment and the electrical system to which it is attached.
- C. All racks, cabinets, enclosures, cable sheaths, metallic strength members, splice cases, cable trays, sleeves, conduits, etc. entering or residing in the EF, ER, MDF or IDF shall be grounded to the respective TGB using conductors as shown on the plans or called for elsewhere in the specifications. Telecommunications grounding conductors shall be a minimum of #6 AWG.
- D. All cable tray sections shall be connected to building ground.
- E. All metallic components of fire-stop fittings and conduits shall be connected to system ground.
- F. All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape. All cables and bus bars shall be identified and labeled in accordance with the System Documentation Section of this specification.
- G. Comply with requirements in Section 26 05 26 for grounding conductors and connectors.
- H. Telecommunications Main Bus Bar:
 1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
 2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.

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3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

- I. Comply with J-STD-607-A.

2.13 FIRE-STOP

- A. Fire-stop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Fire-stop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.
- B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate fire-stop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly fire-stopped.
- C. All through penetrations shall be fire-stopped with Wiremold flamestopper (or equal) adjustable fire-stop fitting with integrated intumescent barrier.
- D. Fire-stop systems shall be UL Classified to ASTM E814 (UL 1479) and shall be approved by a qualified Professional Engineer (PE), licensed (actual or reciprocal) in the state where the work is to be performed. A drawing showing the proposed fire-stop system, stamped/embossed by the PE shall be provided to the Owner's Technical Representative prior to installing the fire-stop system(s).

2.14 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Section 26 05 53.

2.15 LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.16 SOURCE QUALITY CONTROL

- A. Testing Agency: Contractor shall engage a qualified, third party testing agency to evaluate all cables.
- B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.
- E. Cable will be considered defective if it does not pass tests and inspections.

- F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WORK AREA OUTLETS

- A. Cables shall be coiled in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturer's bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. No more than 12" of UTP and 36" of fiber slack shall be stored in an in-wall box, modular furniture raceway, or insulated walls. Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.
- B. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B.1 document, manufacturer's recommendations and best industry practices.
- C. Pair untwist at the termination shall not exceed one-half inch.
- D. Bend radius of the horizontal cable shall not be less than 4 times the outside diameter of the cable
- E. The cable jacket shall be maintained to within one inch of the termination point.
- F. Data jacks, unless otherwise noted in drawings, shall be located in the bottom position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the right-most position(s).
- G. Voice jacks shall occupy the top position(s) on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s).

3.2 INSTALLATION OF EQUIPMENT ROOM FITTINGS

- A. Comply with NECA 1.
- B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.
- C. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- D. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service departments.
 - 1. Meet jointly with owner's telecommunications and LAN equipment departments to exchange information and agree on details of equipment arrangements and installation interfaces.
 - 2. Record agreements reached in meetings and distribute them to other participants.
 - 3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment as directed by owner's IT department.

4. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room. Contractor shall coordinate with owner's IT, Security and maintenance departments and facilitate inter-department coordination for acceptable configuration of shared space in telecom rooms.
- E. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.
- F. Racks/ cabinets shall be securely attached to the concrete floor using a minimum 3/8" hardware or as required by local codes.
- G. Racks/ cabinets shall be placed with a minimum of 36 inch clearance from the walls or other equipment on all sides of the rack. When mounted in a row, maintain a minimum of 36 inches from the wall or equipment behind and in front of the row of racks and from the wall or equipment at each end of the row.
- H. All racks/ cabinets shall be grounded to the telecommunications ground bus bar in accordance with other sections of this document.
- I. Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.
- J. The contractor shall install 24" ladder cable tray from wall to each rack/ cabinet.

3.3 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A.
- B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified elsewhere in this document. Drawings indicate general arrangement of pathways and fittings.
- C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- D. Comply with requirements in Section 26 05 33 for installation of conduits and wireways.
- E. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- F. Pathway Installation in Communications Equipment Rooms:
 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
 2. Install cable trays to route cables if conduits cannot be located in these positions.
 3. Secure conduits to backboard when entering room from overhead.
 4. Extend conduits a minimum of 6 inches above finished floor.
 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.4 WIRING METHODS

- A. Wiring Method: Install cables in raceways, cable trays and J-hooks except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements for raceways and boxes specified in Section 26 05 33.
- B. Conceal conductors and cables in accessible ceilings, walls and floor
- C. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- D. Wiring within Enclosures:
 - 1. Bundle, lace, and train cables within enclosures.
 - 2. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
 - 3. Provide and use lacing bars and distribution spools.
 - 4. Install conductors parallel with or at right angles to sides and back of enclosure.

3.5 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling installation:
 - 1. Comply with TIA/EIA-568-B.1.
 - 2. Cable shall be installed in accordance with manufacturer's recommendations, best industry practices and these specifications.
 - 3. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
 - 4. Cable raceways shall not be filled greater than the ANSI/TIA/EIA-569-A maximum fill for the particular raceway type or 40% (whichever is less).
 - 5. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 - 6. Install 110-style IDC termination hardware as required for copper cables unless otherwise indicated.
 - 7. Terminate all conductors; no cable shall contain un-terminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 8. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 9. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 10. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
 - 11. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable. Any cabling found to be damaged during installation shall be removed and replaced at no cost to owner.
 - 12. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.

13. In the communications equipment room, install a 10-foot long service loop on each end of cable.
14. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
15. MUTOA shall not be used as a cross-connect point.
16. Consolidation points may be used only for making a direct connection to telecommunications outlet/ connectors and may only be used where specifically called for in the contract documents.
 - a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to work station equipment.
 - b. Locate consolidation points for UTP at least 49 feet from communications equipment room.
17. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
18. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.
19. The cable's minimum bend radius and maximum pulling tension shall not be exceeded.
20. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 36 inch intervals. At NO point shall cable(s) rest on acoustic ceiling grids, ceiling panels, electrical conduits, fire alarm system conduits, structural elements, mechanical piping or ductwork.
21. Horizontal distribution cables shall be bundled in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance
22. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
23. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the contractor shall install appropriate carriers to support the cabling. See the plans for approximate support locations and requirements.
24. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.
25. Cables shall be identified by a self-adhesive label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606-A. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.
26. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
27. Pulling tension on 4-pair UTP cables shall not exceed 25-lbf for a four-pair UTP cable.
28. Backbone cabling
 - a. Backbone cables shall be installed separately from horizontal distribution cables.
 - b. Where cables are housed in conduits, the backbone and horizontal cables shall be installed in separate conduits.
 - c. Where backbone cables are installed in an air return plenum, riser rated cable shall be installed in metallic conduit.
 - d. Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.
 - e. All backbone cables shall be securely fastened to the sidewall of the telecom room.

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- f. Backbone cables spanning more than two floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.
- g. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.
- h. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.

C. UTP Cable Installation:

- 1. Comply with TIA/EIA-568-B.2.
- 2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Optical Fiber Cable Installation:

- 1. Comply with TIA/EIA-568-B.3.
- 2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.
- 3. Verify termination type with owner prior to ordering.

E. Open-Cable Installation:

- 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
- 2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 36 inches apart.
- 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

F. Installation of Cable Routed Exposed under Raised Floors:

- 1. Install plenum-rated cable only.
- 2. Install cabling after the flooring system has been installed in raised floor areas.
- 3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

G. UTP cable hardware installation

- 1. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B standard, manufacturer's recommendations and best industry practices.
- 2. Pair untwist at the termination shall not exceed one-half inch.
- 3. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
- 4. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- 5. The cable jacket shall be maintained as close as possible to the termination point.
 - a. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable

H. Optical Fiber hardware installation

1. Splice Trays:
 - a. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.
 - b. Each cable shall be individually attached to the respective splice enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.
 - c. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
 - d. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.
 - e. A maximum of 12 strands of fiber shall be spliced in each tray
 - f. All spare strands shall be installed into spare splice trays.
2. Adapter Plates/ fiber patch panels:

I. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.6 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.

- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 26 05 53.
 - 1. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- E. Cable and Wire Identification:
 - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 50 feet and at every cable pathway transition.
 - 3. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
 - b. Label each unit and field within distribution racks and frames.
 - 4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
 - 5. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.
- F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:
 - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections:
 - 1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
 - 2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
 - 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - 5. Optical Fiber Cable Tests:
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:
 - 1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA-526-14-A, Method B, One Reference Jumper.
 - 2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
 - 6. UTP Performance Tests:
 - a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:
 - 1) Wire map.
 - 2) Length (physical vs. electrical, and length requirements).
 - 3) Insertion loss.
 - 4) Near-end crosstalk (NEXT) loss.
 - 5) Power sum near-end crosstalk (PSNEXT) loss.
 - 6) Equal-level far-end crosstalk (ELFEXT).
 - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
 - 8) Return loss.

- 9) Propagation delay.
 - 10) Delay skew.
- 7. Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.3.
- 8. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.
 - a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
 - b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.
- D. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Perform tests and inspections.
- H. Tests and Inspections:
 - 1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - 4. Optical Fiber Cable Tests:
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:

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- 1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, one Reference Jumper.
 - 2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
- I. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
 - J. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
 - K. End-to-end cabling will be considered defective if it does not pass tests and inspections.
 - L. Prepare test and inspection reports. All testing shall be performed by equipment that has been maintained and calibrated as directed by testing equipment manufacturer. Include calibration history with test and inspection reports.

3.9 SLEEVE AND SLEEVE SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44

3.10 FIRESTOPPING

- A. All fire-stop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance
- B. Comply with TIA-569-B, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.11 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Section 26 05 44.
- B. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the successful contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme. Labeling shall follow the guidelines of ANSI/TIA/EIA-606-A.
- C. All label printing will be machine generated by connectivity/ cabling manufacturer software using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on

each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

- D. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A.
- E. Labels shall be preprinted or computer-printed type.

3.12 DEMONSTRATION

- A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

3.13 TESTING AND ACCEPTANCE

- A. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
- B. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the connectivity/ cabling manufacturer Certification Program Information Manual and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.
- C. Copper Channel Testing.
 - 1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Horizontal cabling shall be tested using a Level III test unit for category 6 performance compliance as specified in ANSI/TIA/EIA-568-B.2-1.
 - 2. Continuity – Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
 - 3. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-B Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.
 - 4. Category 6 Performance
 - a. Follow the Standards requirements established in ANSI/TIA/EIA-568-B .1, B.2-1
 - b. A Level III test unit is required to verify category 6 performance.
 - c. The basic tests required are:

- 1) Wire Map
- 2) Length
- 3) Attenuation
- 4) NEXT (Near end crosstalk)
- 5) Return Loss
- 6) ELFEXT Loss
- 7) Propagation Delay
- 8) Delay skew
- 9) PSNEXT (Power sum near-end crosstalk loss)
- 10) PSELFEXT (Power sum equal level far-end crosstalk loss)

D. Fiber Testing

1. All fiber testing shall be performed on all fibers in the completed end to end system. There shall be no splices unless clearly defined in an RFP. Testing shall consist of an end to end power meter test performed per EIA/TIA-455-53A. The system loss measurements shall be provided at 850 and/or 1300 nanometers for multimode fibers and 1310 and/or 1550 nanometers for single mode fibers. These tests also include continuity checking of each fiber.
2. Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for singlemode) in both directions.
3. Test set-up and performance shall be conducted in accordance with ANSI/EIA/TIA-526-14 Standard, Method B.
4. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. ONLY LINK TEST IS REQUIRED. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA/EIA Standard.
5. Attenuation testing shall be performed with an approved hand held tester from an industry recognized test equipment manufacturer.

E. System Documentation

1. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets and one (1) searchable PDF document to the Engineer for approval. Documentation shall include the items detailed in the sub-sections below.
2. Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.). This is inclusive of all test result and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the telecommunications contractor shall provide copies of the original test results.
3. The Engineer may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

F. Test Results

1. Test documentation shall be provided (in searchable PDF format) on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test

frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

2. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-B including applicable TSB's and amendments. The appropriate Level III tester shall be used to verify Category 6 cabling systems.
3. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. The telecommunications contractor must furnish this information in electronic form (flash drive or CD-ROM).
4. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

3.14 AS-BUILT DRAWINGS

- A. The drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. Construction documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner.
- B. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (PDF format) form.

3.15 WARRANTY

- A. Supplier will honor claims on this warranty for Life (which is defined as the usable life of the building and is referred to as the "Warranty Period" and shall be no less than 30 years).
- B. This warranty covers the copper and fiber optic permanent links of the network (as defined by ANSI/TIA/EIA-568-C.2 for CAT 5e, CAT.6, CAT 6A, ANSI/TIA/EIA-568-C.3 for Optical Fiber Cabling and Components): which includes the cable and connecting hardware.
- C. This warranty will be extended to include the entire channel.
- D. The network copper cabling infrastructure must be installed in accordance with TIA 568 Series Standards, and installed by Leviton Certified installers. The fiber cabling and components shall be installed by a Corning NPI certified installer.
- E. Each permanent link or channel in the network must be field tested in accordance with the TIA 568 series industry standard in force at the time of purchase AND the installed permanent links and channels must have passed all applicable TIA and manufacturer performance requirements.
- F. Appropriate Warranty Application form must be properly completed and submitted to Supplier prior to initiating the installation. The Warranty Submittal Form must be submitted within 10 days of installation completion.

- G. Copies of all certification test reports must be submitted as part of the Warranty Submittal Form, and be kept on file by the registrant to be re-submitted when requested by Supplier. Data must be saved in raw data and summary formats. Submitting the data via online upload, e-mail or on disc are the preferred methods for providing test data.
- H. The Campus Warranty provides that at the time of delivery, Premises Voice-Grade Cable and Outside Plant Cable products, when installed as part of a campus network along with copper and/or fiber cables from specified manufacturer for 100% of the premises LAN installation, will be free from defects in design, material, and manufacture and conform to manufacturer specifications in force at the time of purchase for a period of no less than thirty (30) years from the delivery date (the "Campus Warranty").
- I. Transfer manufacturer's warranties to the owner in addition to the General System Guarantee. Submit these warranties on each item in list form with shop drawings. Detail specific parts within equipment that are subject to separate conditional warranty. Warranty proprietary equipment and systems involved in this contract during the guarantee period. Final payment shall not relieve you of these obligations.
- J. An Extended Product Warranty shall be provided which warrants functionality of all components used in the system for no less than thirty (30) years from the date of registration. The Extended Product Warranty shall warrant the installed horizontal and/or backbone copper, and both the horizontal and the backbone optical fiber portions of the cabling system.
- K. The manufacturer and contractor shall provide a warranty on the physical installation.

3.16 CONTINUING MAINTENANCE

- A. The contractor shall furnish an hourly rate with the proposal submittal, which shall be valid for a period of one year from the date of acceptance. This rate will be used when cabling support is required to affect moves, adds, and changes to the system (MACs). MACs shall be performed by contractor that meets the qualifications outlined elsewhere in these Specifications.

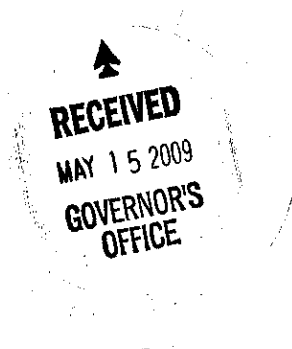
3.17 FINAL ACCEPTANCE AND SYSTEM CERTIFICATION

- A. The contractor shall furnish an hourly rate with the proposal submittal, which shall be valid for a period of one year from the date of acceptance. This rate will be used when cabling support is required to affect moves, adds, and changes to the system (MACs). MACs shall be performed by an connectivity/ cabling manufacturer certified Integrator and shall be added to the warranty when registered with manufacturer. Completion of the installation, in-progress and final inspections, receipt of the test and as-built documentation and successful performance of the cabling system for a two week period will constitute acceptance of the system. Upon successful completion of the installation and subsequent inspection, the end user shall be provided with a numbered certificate, from connectivity/ cabling manufacturer, registering the installation.

END OF SECTION

ACT# 2009- 657

1 HB289
2 111990-4
3 By Representatives Hurst and Sanderford
4 RFD: Boards and Commissions
5 First Read: 03-FEB-09



1
2 ENROLLED, An Act,

3 Relating to fire alarm systems, to create a new
4 chapter in Title 34 of the Code of Alabama 1975, to regulate
5 and license persons who install a fire detection, fire alarm,
6 or fire communication system; to provide for administration by
7 the State Fire Marshal; to provide exceptions; to provide for
8 fees; to provide for criminal and civil penalties; and in
9 connection therewith would have as its purpose or effect the
10 requirement of a new or increased expenditure of local funds
11 within the meaning of Amendment 621 of the Constitution of
12 Alabama of 1901, now appearing as Section 111.05 of the
13 Official Recompilation of the Constitution of Alabama of 1901,
14 as amended.

15 BE IT ENACTED BY THE LEGISLATURE OF ALABAMA:

16 Section 1. Chapter 33A is added to Title 34 of the
17 Code of Alabama 1975, to read as follows:

18 §34-33A-1.

19 For purposes of this chapter, the following words
20 have the following meanings:

21 (1) CERTIFICATE HOLDER. An individual who is listed
22 on the State Fire Marshal's permit as the responsible managing
23 owner, partner, officer, or employee who is actively in charge
24 of the work of the certified fire alarm contractor meeting the
25 requirements established in Section 34-33A-4.

1 (2) CERTIFIED FIRE ALARM CONTRACTOR. A fire alarm
2 contractor who has qualified and received a permit from the
3 State Fire Marshal, with an NICET Level III on staff.

4 (3) FIRE ALARM CONTRACTOR. An individual,
5 partnership, corporation, association, or joint venture
6 engaged in the business of installation, repair, alteration,
7 addition, maintenance, or inspection of fire alarm systems.
8 The term does not include local building officials, fire
9 inspectors, or insurance inspectors when acting in their
10 official capacity.

11 (4) FIRE ALARM SYSTEM. A system or portion of a
12 combination system that consists of components and circuits
13 arranged to monitor and annunciate the status of fire alarm or
14 supervisory signal-initiating devices and to initiate the
15 appropriate response to those signals. ~~The~~ Any system
16 installed after the passage of this chapter shall follow the
17 installation standard set forth by the latest edition of the
18 National Fire Protection Association 72 National Fire Alarm
19 Code. The system shall meet the requirements of all locally
20 adopted codes and standards of the local municipality into
21 which the system is installed and shall be acceptable to the
22 local authority having jurisdiction.

23 (5) LICENSED ELECTRICAL CONTRACTOR. An individual,
24 partnership, corporation, association, or joint venture which
25 is licensed as an electrical contractor engaged in the

1 business of installation of conduit, wire, and fire alarm
2 associated equipment, but does not design, program, certify,
3 inspect, or test fire alarm systems. A licensed electrical
4 contractor is not a fire alarm contractor for the purpose of
5 this chapter.

6 (6) NICET. National Institute for Certification in
7 Engineering Technology.

8 (7) STATE FIRE MARSHAL'S PERMIT. The form issued by
9 the State Fire Marshal to a fire alarm contractor upon
10 application being approved and fee paid. The permit shall be
11 issued in the name of the fire alarm contractor, with the name
12 of the certificate holder noted thereon.

13 §34-33A-2.

14 The administration of this chapter is vested in the
15 State Fire Marshal who shall have the power to set or make
16 changes in the amount of the fee charged as necessary for the
17 administration and enforcement of this chapter.

18 §34-33A-3.

19 (a) It shall be unlawful for any individual,
20 partnership, corporation, association, or joint venture to
21 engage in the business of installation, repair, alteration,
22 addition, maintenance, or inspection of a fire alarm system in
23 this state except in conformity with this chapter.

24 (b) This chapter shall not apply to the following:

(1) The owner of a fire alarm system who employs ~~registered professional fire protection engineers and skilled trained~~ workers who regularly and routinely ~~design~~, install, repair, alter, add to, maintain, and inspect fire alarm systems on and within the premises of the owner for the use of the owner only.

~~(2) A smoke detector installed in one or two family dwellings by a licensed electrical contractor.~~

(2) A smoke detector installed in a residential dwelling.

(3) A residential combination burglary and fire alarm system installed by a licensed burglary alarm contractor in a residential occupancy as defined in the adopted building code where located.

§34-33A-4.

(a) Every fire alarm system installed in this state shall have a record of completion signed by a certified fire alarm contractor, in accordance with the requirements of the adopted building code and fire alarm code. The record of completion and all supporting documents shall be available for inspection by the State Fire Marshal or his or her designated representative during normal business hours.

(b) Every fire alarm system in this state shall have the name, address, phone number, and permit number, of the responsible certified fire alarm contractor attached to the

1 main fire alarm control in a manner as prescribed by and
2 acceptable to the State Fire Marshal.

3 (c) Every fire alarm system in this state installed
4 after the passage of this chapter shall be maintained and
5 inspected by a certified fire alarm contractor in accordance
6 with the requirements of the most recently adopted version of
7 the National Fire Protection Association 72 National Fire
8 Alarm Code. Testing documentation shall be maintained by the
9 owner for inspection by the State Fire Marshal or his or her
10 designated representative during normal business hours.

11 §34-33A-5.

12 (a) Any individual, partnership, corporation,
13 association, or joint venture desiring to engage in the
14 business as a fire alarm contractor shall submit to the State
15 Fire Marshal on standard forms provided by the State Fire
16 Marshal a completed application. The applicant shall include a
17 fee of one hundred dollars (\$100) when making the application.
18 The applicant shall designate in the application the name of
19 the proposed certificate holder and provide written proof that
20 the individual has met all of the requirements and passed a
21 competency test administered by NICET as a Fire Alarm System
22 Technician - Level III or above. A copy of the current NICET
23 certificate shall be accepted as sufficient written proof as
24 required above. The State Fire Marshal, upon receipt of the
25 application and fee, shall issue a State Fire Marshal's permit

1 to a fire alarm contractor who has a current State Fire
2 Marshal's Permit, or who produces evidence of having a current
3 state permit from another state, if the state has entered into
4 an agreement of reciprocity with the State of Alabama.

5 (b) (1) Any individual desiring to engage in the
6 programming, maintenance, testing, inspection, certification,
7 or modification of fire alarm systems shall provide current
8 written proof that he or she has passed a competency test
9 administered by the NICET as a Fire Alarm System Technician -
10 Level II or any other acceptable nationally recognized fire
11 alarm technician certification requiring continuing education
12 that is deemed equivalent by the State Fire Marshal.

13 (2) Each individual, partnership, corporation,
14 association, or joint venture shall have 36 months after the
15 effective date of this chapter to be in full compliance with
16 the requirement of this subsection.

17 (3) A new employee who is hired by a certified fire
18 alarm contractor shall have 12 months from the date of hiring
19 to comply with the requirements of this chapter. A new
20 employee who is not in compliance with this chapter shall work
21 under the direct supervision of the certificate holder of the
22 certified fire alarm contractor.

23 §34-33A-6.

24 If the required fee has been paid, satisfactory
25 written proof from the NICET has been provided that the

1 requirements have been met and a competency test was passed
2 when required by this chapter, and the proposed certificate
3 holder is found to be a responsible, managing owner, partner,
4 officer, or employee of the fire alarm contractor, the State
5 Fire Marshal within 30 days shall issue a State Fire Marshal's
6 permit in the name of the fire alarm contractor with the name
7 of the certificate holder noted thereon.

8 §34-33A-7.

9 A certificate holder may not obtain a State Fire
10 Marshal's permit for more than one fire alarm contractor at
11 any time. A certificate holder may only hold a certificate for
12 the fire alarm contractor where he or she is currently
13 employed. If the certificate holder leaves the employment of
14 the fire alarm contractor, the certificate holder shall notify
15 the State Fire Marshal within 30 days. The certificate holder
16 may not obtain a State Fire Marshal's permit for more than one
17 other fire alarm contractor for a period of 12 months
18 thereafter. If the certificate holder leaves the employment of
19 the fire alarm contractor, or dies, the fire alarm contractor
20 shall have nine months to submit a new application proposing
21 designation of another individual as the certificate holder
22 for the applicant. If the application is not received and a
23 new permit issued within the allotted time, the State Fire
24 Marshal shall revoke the permit of the fire alarm contractor.

25 §34-33A-8.

1 A State Fire Marshal's permit shall expire annually
2 at midnight on September 30. At least 30 days prior to
3 expiration, a renewal application with a renewal fee shall be
4 submitted. A permit which is not renewed prior to expiration
5 shall be null and void on the expiration date, and it shall be
6 unlawful under this chapter for any individual, partnership,
7 corporation, association, or joint venture to engage in the
8 business of installing, repairing, altering, adding,
9 maintaining, or inspecting a fire alarm system without a
10 validly renewed State Fire Marshal's permit. The permit may be
11 reinstated by making application as before and payment of the
12 fee; however, until the time as a new permit is issued, it
13 shall be unlawful for the fire alarm contractor to engage in
14 installing, repairing, altering, adding, maintaining, or
15 inspecting fire alarm systems.

16 §34-33A-9.

17 If a certified fire alarm contractor desires to do
18 business in any part of the state, he or she shall deliver to
19 the local building official a copy of his or her State Fire
20 Marshal's permit. The local building official shall require a
21 copy of the State Fire Marshal's permit before issuing a
22 license or building permit. The certified fire alarm
23 contractor shall pay any fees normally imposed for local
24 licenses or permits. The local official may not impose other
25 requirements on the certified fire alarm contractor to prove

1 competency other than proper evidence of a valid State Fire
2 Marshal's permit.

3 §34-33A-10.

4 Nothing in this chapter limits the power of a
5 municipality, county, or the state to regulate the quality and
6 character of work performed by contractors, through a system
7 of permits, fees, and inspections which are designed to assure
8 compliance with, and aid in the implementation of, state and
9 local building laws or to enforce other local laws for the
10 protection of the public health and safety. Nothing in this
11 chapter limits the power of a municipality, county, or the
12 state to adopt any system of permits requiring submission to
13 and approval by the municipality, county, or the state, of
14 plans and specifications for work to be performed by
15 contractors before commencement of the work..If the plans for
16 a fire alarm system are required to be submitted to and
17 approved by any municipality, county, or the state, or any
18 departments or agencies thereof, the plans shall bear the seal
19 of a professional engineer licensed in the State of Alabama or
20 be submitted by a certified fire alarm contractor. The
21 official authorized to issue building or other related permits
22 shall ascertain that the fire alarm contractor is duly
23 certified by requiring evidence of a valid State Fire
24 Marshal's permit.

25 §34-33A-11.

1 (a) This chapter applies to any fire alarm
2 contractor performing work for any municipality, county, or
3 the state. Officials of any municipality, county, or the state
4 shall determine compliance with this chapter before awarding
5 any contract for the installation, repair, alteration,
6 addition, or inspection of a fire alarm system. Any bid for a
7 contract shall be accompanied by a copy of a valid State Fire
8 Marshal's permit.

9 (b) All architects and engineers preparing plans and
10 specifications for work involving fire alarm systems to be
11 contracted in the State of Alabama shall include in their
12 invitation to bidders and their specifications a copy of this
13 chapter or portions as are deemed necessary to convey to the
14 invited bidder that it will be necessary for the bidder to
15 show evidence of licensure before a bid is considered whether
16 the bidder is a resident or nonresident of this state and
17 whether a license has been issued to the bidder or not.

18 §34-33A-12.

19 All funds collected pursuant to this chapter shall
20 be deposited in the State Treasury to the credit of the State
21 Fire Marshal's Fund authorized in Section 24-5-10. The State
22 Fire Marshal may expend moneys from the State Fire Marshal's
23 Fund for the administration and enforcement of this chapter.
24 The State Fire Marshal may receive grants and donations from
25 associations, firms, or individuals who are interested in the

1 upgrading and quality of fire alarm systems in compliance with
2 Alabama state ethics laws.

3 §34-33A-13.

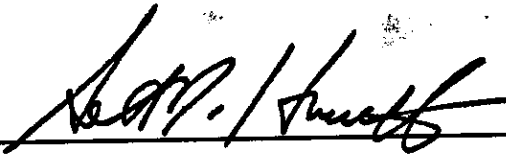
4 Whenever the State Fire Marshal has reason to
5 believe that any individual, partnership, corporation,
6 association, or joint venture is or has been violating any
7 provision of this chapter, the State Fire Marshal or his or
8 her deputy or assistant may issue and deliver to the
9 individual, partnership, corporation, association, or joint
10 venture an order to cease and desist the violation. Failure to
11 comply with any order under this section shall constitute a
12 Class B misdemeanor and shall be punishable as provided by
13 state law. In addition, the State Fire Marshal may impose a
14 civil penalty not to exceed two hundred fifty dollars (\$250)
15 for each day the violation exists. Violation of any provision
16 of this chapter or failure to comply with a cease and desist
17 order shall be cause for revocation of a State Fire Marshal's
18 permit.

19 Section 2. Although this bill would have as its
20 purpose or effect the requirement of a new or increased
21 expenditure of local funds, the bill is excluded from further
22 requirements and application under Amendment '621, now
23 appearing as Section 111.05 of the Official ReCompilation of
24 the Constitution of Alabama of 1901, as amended, because the

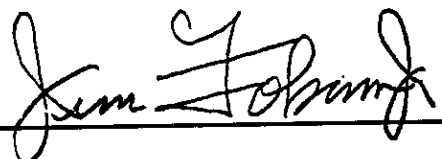
1 bill defines a new crime or amends the definition of an
2 existing crime.

3 Section 3. This act shall become effective on the
4 first day of the third month following its passage and
5 approval by the Governor, or its otherwise becoming law.

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Speaker of the House of Representatives



President and Presiding Officer of the Senate

House of Representatives

I hereby certify that the within Act originated in
and was passed by the House 06-MAY-09, as amended.

Greg Pappas
Clerk

Senate

15-MAY-09

Amended and Passed


House

15-MAY-09

Concurred in Sen-
ate Amendment

APPROVED May 21, 2009

TIME 9:07 a.m.


GOVERNOR

Alabama Secretary Of State

Act Num....: 2009-657
Bill Num...: H-289

Recv'd 05/21/09 02:51pmJJB