SPECIFICATION MANUAL

City of Dyersburg CDBG-NDR

Dyersburg Police Dept.

Training Facility

CDBG No.:54309

July 24, 2020

Owner:

City of Dyersburg

Public Works Department

435 US Hwy 51 Bypass South

Dyersburg, TN 38024

Smith Seckman Reid, Inc.

BRANDON M TAYLOR
REGISTERED ENGINEER
AGRICULTURE
COMMERCE
NO. 118798
STATE OF TENNESSEE
7.27.20

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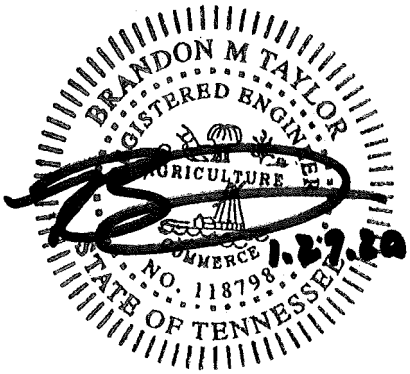
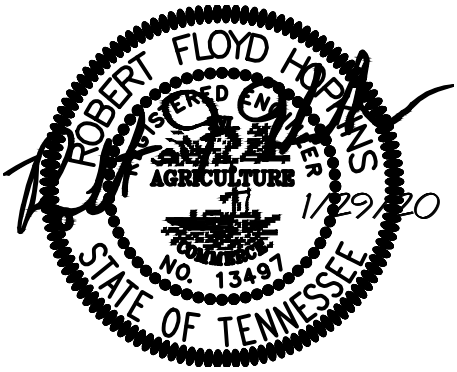
ARCHITECTURAL

CIVIL



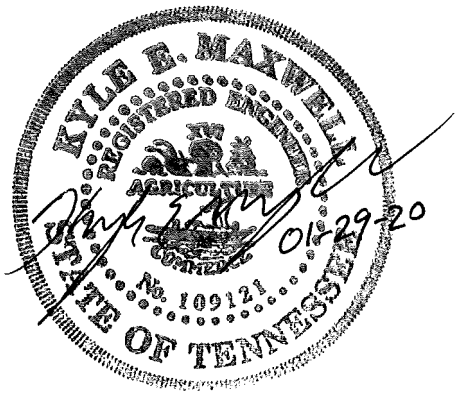
MECHANICAL

ELECTRICAL



LANDSCAPE

STRUCTURAL



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ADVERTISEMENT FOR BIDS

Project No. 54309

City of Dyersburg (Owner)

Separate sealed bids for Police Training Facility and Reconstructed Wetland for Construction of a new 3000 sf metal building as a police training facility and an adjacent reconstructed wetland and stormwater management area the is approximately five acres will be received by City of Dyersburg, Tennessee at the office of City of Dyersburg Public Works-435 Highay 51 S ByPass, Dyersburg, Tennessee 38024 until 10 o'clock A.M./P.M., C.S.T./E.S.T. October 22, 2020, and then at said office publicly opened and read aloud.

The Information for Bidders, Form of Bid, Form of Contract, Plans, Specifications, and Forms of Bid Bond, Performance and Payment Bond, and other contract documents may be examined at the following:

City of Dyersburg Public Works, 435 Highway 51 S Bypass, Dyersburg, TN 38024

https://www.tn.gov/generalservices/procurement/central-procurement-office--cpo-/supplier-information/invitations-to-bid--itb-.html

Copies may be obtained at the office of City of Dyersburg Public Works located at 435 Highway 51 S Bypass, Dyersburg, TN 38024 upon payment of $ 50.00 for each set. Any unsuccessful bidder, upon returning each set promptly and in good condition, will be refunded his payment, and any non-bidder upon so returning such a set will be refunded $ 0.00.

The owner reserves the right to waive any informalities or to reject any or all bids.

Each bidder must deposit with his bid, security in the amount, form and subject to the conditions provided in the Information for Bidders.

All bidders must be licensed General Contractors as required by the Contractor's Licensing Act of 1994 of the General Assembly of the State of Tennessee, and qualified for the type of construction being bid upon.

Attention of bidders is particularly called to the requirements as to conditions of employment to be observed and minimum wage rates to be paid under the contract, Section 3, Segregated Facility, Section 109 and E.O. 11246.

No bidder may withdraw his bid within 60 days after the actual date of the opening thereof.

10/01/2020 (Date) _____

INFORMATION FOR BIDDERS

1. Receipt and Opening of Bids

The City of Dyersburg (herein called the "Owner), invites bids on the form attached hereto, all blanks of which must be appropriately filled in. Bids will be received by the Owner at the office of City of Dyersburg Public Works until 10 o'clock A.M./P.M., C.S.T/E.S.T, _____, 2020, and then at said office publicly opened and read aloud. The envelopes containing the bids must be sealed, addressed to City Engineering at 435 US Highway 51 S Bypass, Dyersburg, TN 38024 and designated as bid for City of Dyersburg CDBG-NDR Wetlands and Recreation Projects: Police Training Facility.

The Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within 60 days after the actual date of the opening thereof.

2. Preparation of Bid:

Each bid must be submitted on the prescribed form and accompanied by Certification of Bidder Regarding Equal Employment Opportunity, Certification of Bidder Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion, Certification of Bidder Regarding Section 3 and Segregated Facilities, and Drug-Free Workplace Affidavit. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures, and the foregoing Certifications must be fully completed and executed when submitted.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his/her address, the name of the project for which the bid is submitted, license number, expiration date thereof, and license classification of the contractors applying to bid for the prime contract, and for the electrical, plumbing, heating, ventilation, and air conditioning contracts, and all other information required by State law..

All bidders must be licensed General Contractors as required by the Contractor's Licensing Act of 1994 of the General Assembly of the State of Tennessee, and qualified for the type of construction being bid upon. Each bidder shall write on the outside of the envelope containing its bid: 1) its Contractor's license number; 2) that part of the classification applying to the bid. If this is not done, the bid will not be opened.

3. Subcontracts:

The bidder is specifically advised that any person, for, or other party to whom it is proposed to award a subcontract under this contract:

a. Must be acceptable to the owner; and

b. Must submit Certification by Proposed Subcontractor Regarding Equal Employment Opportunity, and Certification of Proposed Subcontractor Regarding Section 3 and Segregated Facilities. Approval of the proposed subcontract award cannot be given by the owner unless and until the proposed subcontractor has submitted the Certifications and/or other evidence showing that it has fully complied with any reporting requirements to which it is or was subject.

   Although the bidder is not required to attach such Certifications by proposed subcontractors to his/her bid, the bidder is here advised of this requirement so that appropriate action can be taken to prevent subsequent delay in subcontract awards.

4. Telegraphic Modification:

Any bidder may modify his/her bid by telegraphic communication at any time prior to the scheduled closing time for receipt of bids provided such telegraphic communication is received by the Owner prior to the closing time, and, provided further, the Owner is satisfied that a written confirmation of the telegraphic modification over the signature of the bidder was mailed prior to the closing time. The telegraphic communication should not reveal the bid price but should provide the addition or subtraction or other modification so that the final prices or terms will not be known by the Owner until the sealed bid is opened. If written confirmation is not received within two days from the closing time, no consideration will be given to the telegraphic modification.

5. Method of Bidding:

The Owner invites the following bid(s):

Unit Price Bid, no exceptions or exclusions, per contract documents

6. Qualification of Bidder:

The Owner may make such investigations as s/he deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted.

7. Bid Security:

Each bid must be accompanied by cash, certified check of the bidder, or a bid bond prepared on the form of bid bond attached thereto, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 5% of the bid. Such cash, checks or bid bonds will be returned to all except the three lowest bidders within three days after the opening of bids, and the remaining cash, checks or bid bonds will be returned promptly after the Owner and the accepted bidder have executed the contract, or, if no award has been made within 60 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he/she has not been notified of the acceptance of his/her bid.

8. Liquidated Damages for Failure to Enter into Contract:

The successful bidder, upon his/her failure to refusal to execute and deliver the contract and bonds required within 10 days after she/he has received notice of the acceptance of his/her bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his/her bid.

9. Time of Completion and Liquidated Damages:

Bidder must agree to commence work on or before a date to be specified in a written "Notice to Proceed" of the Owner and to fully complete the project within 180 consecutive calendar days thereafter. Bidder must agree also to pay as liquidated damages, the sum of $500.00 for each consecutive calendar day thereafter as hereinafter provided in the Supplemental General Conditions.

10. Condition of Work:

Each bidder must inform him/herself fully of the conditions relating to the construction of the project and the employment of labor thereof. Failure to do so will not relieve a successful bidder of his/her obligation to furnish all material and labor necessary to carry out the provisions of his/her contract. Insofar as possible, the contractor, in carrying out the work, must employ such methods as will not cause any interruption of or interference with the work of any other contractor.

11. Addenda and Interpretations:

No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally.

Every request for such interpretation should be in writing addressed to

Tiffany Heard, PE at theard@dyersburgtn.gov

and to be given consideration must be received at least five days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed by certified mail with return receipt requested or emailed to all prospective bidders (at the respective addresses furnished for such purposes), not later than two days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his/her bid as submitted. All addenda so issued shall become part of the contract documents.

12. Security for Faithful Performance:

Simultaneously with his/her delivery of the executed contract, the Contractor shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract, as specified in the General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner.

13. Power of Attorney:

Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

14. Notice of Special Conditions:

Attention is particularly called to those parts of the contract documents and specifications which deal with the following:

a. Inspection and testing of materials.
b. Insurance requirements.
c. Wage rates.
d. Stated allowances.

15. Laws and Regulations:

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

16. Method of Award - Lowest Qualified Bidder:

After receiving bids and determining the amount of funds estimated by the OWNER as available to finance the contract, the OWNER will award the contract to the lowest responsible bidder. The lowest responsible bidder will be determined upon the basis of the lowest base bid or lowest base bid combined with alternates (additive or deductive). If the contract is to be awarded based on the lowest base bid with alternates, alternates will be accepted in the numerical order in which they are listed in the Form of Bid.

17. Obligation of Bidder:

At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect of his/her bid.

18. Safety Standards and Accident Prevention: With respect to all work performed under this contract, the Contractor shall:

a. Comply with the safety standards provisions of applicable laws, building and construction codes and the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, the requirements of the Occupational Safety and Health Act of 1970 (Public Law 91-596), and the requirements of Title 29 of the Code of Federal Regulations, Section 1518 as published in the "Federal Register", Volume 36, No. 75, Saturday, April 17, 1971.

b. Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) and property.

c. Maintain at his/her office or other well known place at the job site, all articles necessary for giving first aid to the injured, and shall make standing arrangements for the immediate removal to a hospital or a doctor's care of persons (including employees), who may be injured on the job site. In no case shall employees be permitted to work at a job site before the employer has made a standing arrangement for removal of injured persons to a hospital or a doctor's care.

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____
_____
as Principal, and _____
as Surety, are hereby held and firmly bound unto _____
as owner in the penal sum of _____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed, this _____ day of _____, 20____.

The condition of the above obligation is such that whereas the Principal has submitted to _____ a certain Bid, attached hereto and hereby made a part hereof to enter into a contract in writing for the
_____
_____
_____

NOW, THEREFORE,

(a) If said Bid shall be rejected, or in the alternate.

(b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid, then this obligation shall be void, otherwise the same shall remain in force and effect, it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The surety for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by an extension of the time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

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

_____ (L.S.)
Principal

_____
Surety

SEAL

By: _____

BID FOR UNIT PRICE CONTRACTS

Place Dyersburg, Tennessee
Date _____
Project No. CDBG No. 54309

Proposal of Police Training Facility & Reconstructed Wetland (hereinafter called "Bidder")[1] a corporation, organized and existing under the laws of the State of Tennessee, partnership, or an individual doing business as _____.

To the City of Dyersburg (hereinafter called "Owner")

Gentlemen:

The Bidder, in compliance with your invitation for bids for the construction of a

Police Training Facility and Reconstructed Wetland,
having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the contract documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the contract documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in written "Notice to Proceed" of the Owner and to fully complete the project within 180 consecutive calendar days thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages the sum of $500.00 for each consecutive calendar day thereafter as hereinafter provided in Paragraph 3.c. of the Supplemental General Conditions.

[1] Insert corporation, partnership or individual as applicable.

Bidder acknowledges receipts of the following addendum:

_____

_____

_____

Bidder agrees to perform all the **Dyersburg Police Dept. Training Facility and associated work** described in the specifications and shown on plans for the following unit prices

Item No.		Description	QTY.	Unit	Unit Cost	Total Cost
1		Mobilization/Demobilization	1	L.S.		
2		Traffic Control	1	L.S.		
3	*	Temporary Silt Fence (without Backing)	1451	L.F.		
4	*	Temporary Silt Fence (with Backing)	1621	L.F.		
5	*	Temporary Sediment Tube (staked)	446	L.F.		
6	*	Temporary Construction Entrance/Exit	2	E.A.		
7	*	Temporary Rock Silt Screen (at Pipe Inlets)	4	E.A.		
8	*	Temporary Tree Protection	140	L.F.		
9	X	Asphalt Removal	5,310	S.Y.		
10	*	Saw Cutting Asphalt Pavement	465	L.F.		
11	*	Removal of Ex. Water Meter and Cap Existing Tap	2	E.A.		
12	*	Adjustment of Existing Manhole	1	E.A.		
13	X	Site Grading (Shifting Dirt On-Site)	1	L.S.		
14	O	Roundstone Seed (Southern Bio-Swale Seed Mix)	1	L.S.		
15	O	TDOT Spec 801, Group C Seed Mix	1	L.S.		

Total Bid _____

SEE BID ALTERNATES 1 & 2 ON THE NEXT SHEET

Bid Alternate 1 is derived by adding items #18-36 to base bid and grand totaling entire project

Item No.		Description	QTY.	Unit	Unit Cost	Total Cost
16	Z	Building	1	L.S.		
17	Y	2" C900 Water Pipe	245	L.F.		
18	*	Connect 2" Water to Existing Service	1	E.A.		
19	Y	4" SDR 26 PVC Sanitary Sewer Pipe	200	L.F.		
20	*	Connect 4" Sewer to Existing Manhole	1	E.A.		
21	Y	Drop Sewer Manhole, > 4' - 8' Depth	1	E.A.		
22	Y	4" Sewer Cleanout	1	E.A.		
23	*	Concrete Sidewalk (4")	894	S.F.		
24	*	Detectable Warning Surface	76	S.F.		
25		HVAC Foundation Pad	2	E.A.		
26	*	Asphalt (PG 64-22, TDOT 307-C) Binder Course (Thickness Varies)	53	TONS		
27	*	Asphalt (PG 64-22, TDOT 411-E) 1.5" Surface course	37	TONS		
28	*	Tack Coat 0.1 gal/sy	0.25	TONS		
29	*	Prime Coat (parking lot/on-site drive only)	0.75	TONS		
30	*	CR610 Base	182.25	TON		
31	*	Painted Parking Striping (4" Wide)	168	L.F.		
32	*	Painted Handicap Parking Pavement Markings	1	E.A.		
33	*	Painted Channelized Pavement Marking	160	S.F.		
34	*	Handicap Signage	1	E.A.		
35	*	Precast Concrete Wheel Stops	9	E.A.		

Total Bid (Base + Alternate 1) _____

Bid Alternate 2 is derived by adding items #37-44 to base bid and grand totaling entire project (Refer to Landscape Plans)

Item No.		Description	QTY.	Unit	Unit Cost	Total Cost
36	O	Red Maple Tree (Bare Root)	332	E.A.		
37	O	Pecan Tree (Bare Root)	394	E.A.		
38	O	Green Ash Tree (Bare Root)	409	E.A.		
39	O	Blackgum Tree (Bare Root)	479	E.A.		
40	O	Swamp Chestnut Oak (Bare Root)	401	E.A.		
41	O	Lacebark Elm (1-1/2" - 2" Cal.)	5	E.A.		
42	O	Landscape Around Building (Shrubs & Perennials)	1	L.S.		
43	O	Tifway 419 Bermuda Sod	1	L.S.		

Total Bid (Base + Alternate 2) _____

* - Unit price to include all costs associated (Materials, Excavation, Installation labor, etc.)
X- Dirt volume is +/-balanced, any excess to be scattered on site. Unit price to include excavation & shifting
Y- Unit price to include Materials, Excavation, Trenching & Bedding (per detail), and Installation Labor
Z- Unit price to include all costs associated to build turn-key facility per plan set
O- Refer to Landscape Plans (Sheet L1.1) for quantity & details (Price to include Materials & Installation labor)
(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)
The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurace, etc., to cover the finished work of the several kinds called for.

Bidder understands the Owner reserves the right to reject any or all bids and to waive any informalities in bidding.

The Bidder aggrees that this bid shall be good and may not be withdrawn for a period of 60 days after the scheduled closing time for receiving bids.

Bidder acknowledges receipt of the following addendum:

_____

_____

_____

Bidder agrees to perform all the _____ work described in the specifications and shown on the plans, for the following unit prices:

ITEM NO.	EST. QTY.	DESCRIPTION	UNIT PRICE (Each)	Total
1	_____	_____	_____ Dollars & Cents	_____ Dollars & Cents
		_____	($_____)	($_____)
2	_____	_____	_____ Dollars & Cents	_____ Dollars & Cents
		_____	($_____)	($_____)
3	_____	_____	_____ Dollars & Cents	_____ Dollars & Cents
		_____	($_____)	($_____)
			TOTAL OF BID	$_____

(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The bidder agrees that this bid shall be good and may not be withdrawn for a period of 60 days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, bidder will execute the formal contract attached within 10 days and deliver a Surety Bond or Bonds as required by Article 5 of the General Conditions. The bid security attached in the sum of

_____

($_____) is to become the property of the Owner in the event the contract and bond are not executed within the time above set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

Respectfully submitted:

By: _____
(Title)

(SEAL - if bid is by a corporation)

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CERTIFICATION OF BIDDER REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

INSTRUCTIONS

This certification is required pursuant to 24.CFR Section 24.510(b). It shall be completed, signed and submitted as part of the bid proposal.

1. By signing and submitting this proposal, the prospective lower-tier participant certifies that neither it, its principals nor affiliates, is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. Further, the Participant provides the certification set out below:

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that an erroneous certification was rendered, in addition to other remedies available to the Federal Government, the Department or agency with which this transaction originated may pursue available remedies.

3. Further, the Participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the Participant learns that this certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. By submitting this proposal, it is agreed that should the proposed covered transaction be entered into, the Participant will 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 agency with which this transaction originated.

5. It is further agreed that by submitting this proposal, the Participant will include this Certification, without modification, in all lower-tier covered transactions and in all solicitations for lower-tier covered transactions.

Contractor Name and Title _____ Date _____

Signature _____ Address _____

City _____ State _____ Zip ___

NON-CERTIFICATION:

As the prospective lower-tier participant, I am unable to certify to statements in this Certification as explained in the attachment to this proposal.

Contractor Name and Title _____ Date _____

Signature _____ Address _____

City _____ State _____ Zip ___

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

This form must be submitted to the State with the bid tabulations.

CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY

INSTRUCTIONS

This certification is required pursuant to Executive Order 11246 (30 F. R. 12319-25). The implementing rules and regulations provide that any bidder or prospective contractor, or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicates that the bidder has not filed a compliance report due under applicable instructions, such bidder shall be required to submit a compliance report within seven calendar days after bid opening. No contract shall be awarded unless such report is submitted.

CERTIFICATION BY BIDDER

Name and Address of Bidder *(include Zip Code)*:

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause.

❑ Yes ❑ No

2. Compliance reports were required to be filed in connection with such contract or subcontract.

❑ Yes ❑ No

3. Bidder has filed all compliance reports due under applicable instructions, including SF-100.

❑ Yes ❑ No ❑ None Required

4. Have you ever been or are you being considered for sanction due to violation of Executive Order 11246, as amended?

❑ Yes ❑ No

NAME AND TITLE OF SIGNER *(Please type)*

SIGNATURE DATE

CERTIFICATION OF BIDDER REGARDING USE OF FEMALE/MINORITY SUBCONTRACTORS

INSTRUCTIONS

This certification is required for the contractor to demonstrate that when subcontractors are to be used on this project, an attempt will be made to utilize female/minority owned firms.

Documentation must be on file to show who has been contacted.

CERTIFICATION BY BIDDER

Name and Address of Bidder (include Zip Code):

I, _____, certify that every attempt was made to utilize female/minority contractors on this project.

_____

Name and Title of Signer

Signature **Date**

CERTIFICATION OF BIDDER REGARDING SECTION 3 AND SEGREGATED FACILITIES

_____ _____
Name of Prime Contractor Project Name & Number

The undersigned hereby certifies that

(a) Section 3 provisions are included in the Contract.

(b) If contract equals or exceeds $100,000, HUD form 60002 will be submitted with the final pay estimate.

(c) No segregated facilities will be maintained.

_____
Name & Title of Signer (Print or Type)

_____ _____
Signature Date

DRUG-FREE WORKPLACE AFFIDAVIT

STATE OF _____
COUNTY OF _____

The undersigned, principal officer of _____, an employer of five (5) or more employees contracting with _____ government to provide construction services, hereby states under oath as follows:

1. The undersigned is a principal officer of _____ (hereinafter referred to as the "Company"), and is duly authorized to execute this Affidavit on behalf of the Company.
2. The Company submits this Affidavit pursuant to T.C.A. § 50-9-113, which requires each employer with no less than five (5) employees receiving pay who contracts with the state or any local government to provide construction services to submit an affidavit stating that such employer has a drug-free workplace program that complies with Title 50, Chapter 9, of the *Tennessee Code Annotated*.
3. The Company is in compliance with T.C.A. § 50-9-113.

Further affiant saith not.

_____
Principal Officer

STATE OF _____
COUNTY OF _____

Before me personally appeared _____, with whom I am personally acquainted (or proved to me on the basis of satisfactory evidence), and who acknowledged that such person executed the foregoing affidavit for the purposes therein contained.

Witness my hand and seal at office this _____ day of _____, 20__.

_____
Notary Public

My commission expires: _____

CERTIFICATION BY PROPOSED SUBCONTRACTOR REGARDING EQUAL EMPLOYMENT OPPORTUNITY

NAME OF PRIME CONTRACTOR | PROJECT NUMBER

INSTRUCTIONS

This certification is required pursuant to Executive Order 11246 (30 F. R. 12319-25). The implementing rules and regulations provide that any bidder or prospective contractor, or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicates that the subcontractor has not filed a compliance report due under applicable instructions, such subcontractor shall be required to submit a compliance report before the owner approves the subcontract or permits work to begin under the subcontract.

SUBCONTRACTOR'S CERTIFICATION

NAME AND ADDRESS OF SUBCONTRACTOR *(include ZIP Code)*:

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause.

   ❑ Yes ❑ No

2. Compliance reports were required to be filed in connection with such contract or subcontract.

   ❑ Yes ❑ No

3. Bidder has filed all compliance reports due under applicable instructions, including SF-100.

   ❑ Yes ❑ No ❑ None Required

4. Have you ever been or are you being considered for sanction due to violation of Executive Order 11246, as amended?

   ❑ Yes ❑ No

NAME AND TITLE OF SIGNER *(Please type)*

SIGNATURE | DATE

CERTIFICATION OF PROPOSED SUBCONTRACTOR REGARDING SECTION 3 AND SEGREGATED FACILITIES

_____ _____
Name of Subcontractor Project Name & Number

The undersigned hereby certifies that

(a) Section 3 provisions are included in the Contract;

(b) If contract equals or exceeds $100,000, HUD form 60002 will be submitted with the final pay estimate.

(c) No segregated facilities will be maintained as required by Title VI of the Civil Rights Act of 1964.

_____
Name & Title of Signer (Print or Type)

_____ _____
Signature Date

STATEMENT OF COMPLIANCE CERTIFICATE ILLEGAL IMMIGRANTS

EACH CONTRACTOR BIDDING SHALL FILL IN AND SIGN THE FOLLOWING

This is to certify that _____ have fully complied with all the requirements of Chapter No. 878 (House Bill No. 111 and Senate Bill No. 411) which serves to amend Tennessee Code Annotated Title 12, Chapter 4, Part I, attached herein for reference.

- All Bidders for construction services on this project shall be required to submit an affidavit (by executing this compliance document) as part of their bid, that attests that such Bidder shall comply with requirements of Chapter no. 878.

Signed: _____

State of _____)
) ss
County of _____)

Personally appeared before me, _____ the undersigned Notary Public, _____, the within named bargainer, with whom I am personally acquainted, and known to me to be the President / Owner / Partner (as applicable) of the _____, Corporation, Partnership, Sole Proprietorship (as applicable) and acknowledged to me that he executed the foregoing document for the purposes recited therein.

Witness my hand, at office, this _____ day of _____, 20__.

_____
Notary Public

My commission expires _____

WAGE RATE DETERMINATION

Appropriate Wage Rates shall be inserted here.

S rt

M R ET WE

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"General Decision Number: TN20200039 02/28/2020

Superseded General Decision Number: TN20190039

State: Tennessee

Construction Type: Building

County: Dyer County in Tennessee.

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

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.80 for calendar year 2020 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.80 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2020. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate,if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2020
1	02/28/2020

ENGI0369-006 05/01/2013

	Rates	Fringes
OPERATOR: Bulldozer	$ 24.47	10.85
OPERATOR: Forklift	$ 24.47	10.85

IRON0167-011 05/01/2019

	Rates	Fringes
IRONWORKER, STRUCTURAL AND REINFORCING	$ 27.39	16.59

PAIN0049-004 06/01/2006

	Rates	Fringes
PAINTER: Brush and Roller, Excludes Drywall Finishing/Taping	$ 15.07	5.42

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* PLUM0614-003 07/01/2019

	Rates	Fringes
PIPEFITTER	$ 32.51	15.70

SUTN2009-038 09/21/2009

	Rates	Fringes
BRICKLAYER	$ 23.03	0.00
CARPENTER, Includes Form Work (Excludes Drywall Hanging)	$ 17.02	0.00
CEMENT MASON/CONCRETE FINISHER	$ 11.14	1.51
DRYWALL FINISHER/TAPER	$ 13.88	0.00
DRYWALL HANGER	$ 14.00	0.00
ELECTRICIAN, Includes Installtion of Alarms and Sound Systems	$ 15.92	3.20
GLAZIER	$ 12.28	2.52
LABORER: Common or General	$ 9.00	0.17
LABORER: Mason Tender - Brick	$ 12.00	0.00
MECHANICAL INSULATOR, Including Duct and Pipe Insulation	$ 15.00	1.21
OPERATOR: Backhoe/Excavator/Trackhoe	$ 15.93	0.00
OPERATOR: Crane	$ 18.42	2.02
OPERATOR: Grader/Blade	$ 15.05	1.42
OPERATOR: Roller	$ 12.00	0.00
PAINTER: Spray (Excludes Drywall Finishing/Taping)	$ 12.00	0.00
PLUMBER	$ 14.31	0.89
ROOFER, Includes Rubber, and Shake & Shingle Roofs	$ 15.38	0.00
SHEET METAL WORKER, Includes HVAC Duct Installation	$ 15.60	0.89
TRUCK DRIVER: Dump Truck	$ 11.37	1.50

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

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave

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

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

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

Union Rate Identifiers

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

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

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average

calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

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

Union Average Rate Identifiers

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

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

WAGE DETERMINATION APPEALS PROCESS

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

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

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

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

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

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

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

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

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

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

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

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END OF GENERAL DECISION"

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AGREEMENT

THIS AGREEMENT, made this _____ day of _____, 20____, by and between _____, herein called "Owner", acting herein through its _____ _____, and _____

STRIKE OUT INAPPLICABLE TERMS (a corporation) (a partnership) (an individual doing business as _____)

of _____, County of _____, and State of _____, hereinafter called "Contractor".

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the OWNER, the CONTRACTOR hereby agrees with the OWNER to commence and complete the construction described as follows:

hereinafter called "the project", for the sum of _____

_____ Dollars ($_____)
and all extra work in connection therewith, under the terms as stated in the General and Special Conditions of the Contract; and at this (its or their) own property cost and expense to furnish all the materials , supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the Proposal, the General Conditions, Supplemental General Conditions and Special Conditions of the Contract, the plans, which include all maps, plats, blue prints, and other drawings and printed or written explanatory matter thereof, the specifications and contract documents therefore as prepared by _____, herein entitled "the Architect/Engineer", and as enumerated in Paragraph 1 of the Supplemental General Conditions, all of which are made a part hereof and collectively evidence and constitute the contract.

The Contractor hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" of the Owner and to fully complete the project within 180 consecutive calendar days thereafter. The Contractor further agrees to pay, as liquidated damages, the sum of $500.00 for each consecutive calendar day thereafter as hereinafter provided in Paragraph 3 of the Supplemental General Conditions.

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the contract, subject to additions and deductions, as provided in the General Conditions of the Contract, and to make payments on account thereof as provided in Paragraph 3, "Payments to Contractor", of the Supplemental General Conditions.

IN WITNESS WHEREOF, the parties to these presents have executed this contract in six (6) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

(Seal)
ATTEST:

_____
(Secretary)

_____
(Witness)

City of Dyersburg
(Owner)

By: John Holden

Mayor
(Title)

(Seal)

_____
(Contractor)

By: _____

_____
(Secretary)

_____
(Witness)

_____
(Title)

_____
(Address and Zip Code)

NOTE: Secretary of the Owner should attest. If Contractor is a corporation, Secretary should attest.

BONDING AND INSURANCE

1. This Attachment sets forth bonding and insurance requirements for grants. No other bonding and insurance requirements shall be imposed other than those normally required by the grantee.

2. Except as otherwise required by law, a grant that requires the contracting (or subcontracting) for construction or facility improvements shall provide for the grantee to follow its own requirements relating to bid guarantees, performance bonds, and payment bonds unless the construction contract or subcontract exceeds $100,000. For those contracts or subcontracts exceeding $100,000, the Federal agency may accept the bonding policy and requirements of the grantee provided the Federal agency has made a determination that the Government's interest is adequately protected. If such a determination has not been made, the minimum requirements shall be as follows:

   (a) A bid guarantee from each bidder equivalent to five percent of the bid price. The "bid guarantee" shall consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying a bid as assurance that the bidder will, upon acceptance of his bid, execute such contractual documents as may be required within the time specified.

   (b) A performance bond on the part of the contractor for 100 percent of the contract price. A "performance bond" is one executed in connection with a contract to secure fulfillment of all the contractor's obligations under such contract.

   (c) A payment bond on the part of the contractor for 100 percent of the contract price. A "payment bond" is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.

3. Where the Federal Government guarantees or insures the repayment of money borrowed by the grantee, the Federal agency, at its discretion, may require adequate bonding and insurance if the bonding and insurance requirements of the grantee are not deemed adequate to protect the interest of the Federal Government.

4. Where bonds are required in the situations described above, the bonds shall be obtained from companies holding certificates of authority as acceptable sureties (31 CFR 223).

NOTE: AIA Document A311 is acceptable for use as Performance and Payment Bonds.

CERTIFICATE OF OWNER'S ATTORNEY

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

I have examined the attached contract(s) and surety bonds and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions and provisions thereof.

Date: _____ _____

Certification
of
Compliance with Minimum Standards for Accessibility by the Physically Handicapped

Contract No. 54309

Project Name: City of Dyersburg CDBG-NDR Wetlands & Rec Police Training Facility and Reconstructed Wetland

Address: 800 US Highway 51 South Bypass, Dyersburg, TN 28024

Pursuant to the requirements of the Architectural Barriers Act of 1968, 42 USC 4151, and the regulations issued subsequent thereto, the undersigned certifies that the design of the above-mentioned project is in conformance with the minimum standards contained in the American Standard Specifications for Making Buildings and Facilities Accessible To and Usable by the Physically Handicapped, Number A-117.1R-1971 (as modified by 41 CFR 101-19.603).

Professional Registrant for the Project: Brandon Taylor

Legal Name and Address: SSR Inc

2650 Thousand Oaks Blvd

Memphis, Tn 38118

Registration Number: 118798

Name: Brandon Taylor

(Signature)

Date: July 24, 2020

Local Government Official:

(Signature)

Status of Land Acquisition

All permanent easements, land purchases, city/county/state right of ways, Department of Transportation, Corps of Engineers and railroad permits and any other land access agreements must be obtained and recorded (if applicable) with the appropriate agencies prior to ECD approval of plans and specifications.

Please check the following boxes and sign below:

Yes	No	N/A	
☑	☐	☐	All permanent easements necessary for the construction of this project have been acquired and recorded with the appropriate agency.
☑	☐	☐	All land acquisition necessary for the construction of this project has been acquired and recorded with the appropriate agency.
☑	☐	☐	All right-of-ways, permits, and land access agreements necessary for the construction of this project have been acquired and recorded with the appropriate agency(s).

OR

☐	☐	☐	The construction of this project requires no acquisition of land, permanent easements, right-of-ways, permits or land access agreements.

Jeffery Heard

Signature of grantee, engineer/architect, or project administrator

1/30/2020

Date

This form must be sent to ECD before we can approve plans and specifications.

PROJECT WAGE RATE SHEET

Project Name:	Wage Decision Number/Modification Number
Project Number:	Project County:

Employee	Work Classification*	Hourly Rate	Fringe Benefits						Total Wage
			Health Insurance	Vacation Pay	Sick Leave Pay	Retirement Benefits	Other - List: _____	TOTAL FRINGE	

This form is a breakdown of the hourly rate plus the company-paid fringe benefits for each employee working on this project.

* List each classification for an employee on a different line and indicate category (i.e. building or heavy) for each classification.

_____

(Company person authorized to sign)
(Company name)

CLEARANCE OF LOREC NOTATIONS for P&S APPROVAL

Project Name Dyersburg CDBG-NDR Wetlands & Recreation Projects:Police Training Facility and Reconstructed Wetland

Contract Number 54309

Agency, Date and Notation 1:

The Tennessee Historical Commission, State Historic Preservation Office in a letter dated May 30, 2017 stated "If your agency proposes any modifications in current project or plans or discovers any archaeological remains during ground disturbance or construction phase, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act."

Response to Notation 1:

If any modifications are made to the plans or any archaeological remains are discovered during the construction phase, the Tennessee Historical Commission, State Historic Preservation Office will be contacted.

Agency, Date and Notation 2:

The United States Department of Defense, Department of the Army, Memphis District Corps of Engineers (USACE) in a letter dated September 6, 2017 stated "Based on a preliminary jurisdictional determination, a Section 404 permit would be required for this proposed project."

Additionally it stated "Based on the information submitted to this office, the proposed work meets the criteria of Nationwide Permit (NWP) No. 42, pursuant to the Federal Register, Vol. 82, No. 4 dated January 6, 2017... special conditions must be met... Special condition: A final mitigation plan must be submitted to and approved by the Memphis District Engineer before this permit will be authorized and work can begin."

Response to Notation 2:

The 404 permit has been issued.

Agency, Date and Notation 3:

The United States Department of the Interior, Fish and Wildlife Service, Tennessee Office in a letter dated May 26, 2017 stated "[...] indicated implementation of the proposal would require tree remove, therefore Tioga Environmental Consultants, Inc., elected to conduct a bat habitat assessment." U.S. Fish and Wildlife Service personnel have reviewed the info and commented that the assessment identified 7 potentially suitable roosting trees for federally protect bat species.

Response to Notation 3:

In response to Notation 3, this specific project will not be removing any trees, thus rendering it N/A to this specific phase of the project.

CLEARANCE OF LOREC NOTATIONS for P&S APPROVAL

Project Name Dyersburg CDBG-NDR Wetlands & Recreation Projects: Police Training Facility & Reconstructed Wetland

Contract Number 54309

Agency, Date and Notation 4:

The Tennessee Department of Environment and Conservation, Air Pollution Control Division in an email dated June 1, 2017 stated "It is recommended that ordinary dust control measures must be employed to mitigate any dust emissions generated, These measures may include wetting by water spray any areas likely to generate fugitive dust during on site construction activities as needed..."
It is also recommended that all construction or earth moving equipment be well maintained and utilized in a manner to reduce un-necessary idling exhaust emissions. The project does not include references to open burning or disposal of tress or limbs and any undergrowth as a result of land clearing activities. If any open burning is proposed to be conducted we recommend that all state regulations [be reviewed follow] before any planned open burn activities are conducted"

Response to Notation 4:

The contractor will implement dust control as needed during construction to keep the emissions to a minimum, as well as being diligent when it comes to machinery emissions (i.e. not having earth moving machines run much longer than what is needed). As for burning, in the event of a needed open burn, the contractor will follow the state regulations and recommendations.

Agency, Date and Notation 5:

The Tennessee Department of Environment and Conservation, Underground Storage Tanks in an email dated November 6, 2017 stated "There were only four sites that looked close to your project areas: United Parcel Services 750 Samaria Bend Road- Active Tanks; Public Works Storage Yard 327 Church St.- All tanks closed; Clark Distributing Company 1300 U.S. 51- active tanks; Dodge's Store 801 South Main Avenue- active tanks. If a facility closed its tank before 1988 it probably did not register with us. If a tank contains other than petroleum it does not have to register with us.

Response to Notation 5:

There are no known underground storage tanks on the site. In the event of any tanks uncovered or encountered during construction, the contractor will notify the Jackson Field Office as soon as possible.

Agency, Date and Notation 6:

The Tennessee Department of Environment and Conservation, Division of Water Resources, Compliance and Enforcement Unit in a letter dated June 13, 2017 stated "Based on the limited information available, it appears the project will require wetland delineations and one or more Aquatic Resource Alteration Permits (ARAPs). The disturbed land acreages involved for the Soccer Complex, Farmers Market, South Precinct and Reclaimed Wetlands will each involve well over one acre of land disturbance and will all need to be permitted under a General national Pollutant Discharge Elimination System (NPDES) permit for discharges of storm water associated with construction activities (CGP). The 12' wide asphalt trail from Highway 51 to the Farmer's and Market adjacent to the Forked Deer River will also need to be included in the CGP."

Response to Notation 6:

ARAP approval issued 8/31/2017, Renewed December 2019

CLEARANCE OF LOREC NOTATIONS for P&S APPROVAL

Project Name Dyersburg CDBG-NDR Wetlands & Recreation Projects: Police Training Facility & Reconstructed Wetland

Contract Number 54309

Agency, Date and Notation 7:

The Tennessee Department of Environment and Conservation, Jackson Environmental Field Office, Division of Water Resources in a letter dated August 31, 2017 stated "This activity is governed by the General permit for Minor Alterations to Wetlands. The work must be accomplished in conformance with accepted plans and information submitted in support of application NR 1702.037 and the limitations and conditions set fort in the General Permit for Minor Alterations to Wetlands (enclosed). Is is the responsibility of the permittee to ensure that all contractors involved with this project have read and understand the permit conditions before this project begins.

Please note that this alteration shall not cause measurable degradation to resource values and classified uses of hydrologically connected wetlands or other water of the state. Adjacent wetlands or st4reams determined likely to be measureable degraded by hydrologic alteration or partial fill must be included in the cumulative impact calculation. In addition, adequate erosion controls must be installed prior to construction and maintained during construction of the project. All disturbed areas must be re-vegetated or otherwise stabilized upon completion of construction.

Response to Notation 7:

The contractor will install all erosion control measures before the commencement of construction, will maintain and/or replace any measure that is not adequate and will re-vegetate and stabilize in a timely fashion upon completion of construction.

Agency, Date and Notation 8:

The Tennessee Department of Environment and Conservation of Natural Areas, Natural Heritage Program in a letter dated June 2, 2017, stated "Base on the habitat within the project area, we do not anticipate any impacts to rare, threatened, or endangered plant species from this project. We defer to TWRA for comments related to state listed rare animal species...

Should suitable habitat exist on or immediately downstream of the site, we ask that project plans provide for the protection of these species. We as that you coordinate this project with TWRA (Rob Todd, 615.781.6577) to ensure that legal requirements for protection of state listed rare animals are addressed. For stabilization of disturbed areas, the Tennessee natural Heritage Program advocates the use of native trees, shrubs and warm season grasses where practicable. Care should be taken to prevent re-vegetation of disturbed areas with plants listed by the Tennessee Exotic Pest Plant Council as Harmful exotic plant: http://www.tneppc.org/"
TWA in a email dated May 11, 2017 stated '... we have no concerns regarding the project and do not anticipate adverse impacts to state listed species under our authority due to the proposed project."

Response to Notation 8:

There are not any indications that this project will negatively affect any rare or endangered plant species or animal species. If a situation were to arise, the contractor will contact Rob Todd with TWRA. As far as re-vegetation, the materials to be used are common and acceptable to the region.

Tiffany M. Heard, Engineer — 10/29/2018

Signature, Title **Date**

This form must accompany Plans and Specifications sent to ECD.

IRAN DIVESTMENT ACT

In compliance with the Iran Divestment Act (State of Tennessee 2016, Public Chapter No. 817), which became effective on July 1, 2016, certification is required of all bidders on contracts over $1,000.

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party hereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to T.C.A. § 12-12-106.

I affirm, under the penalties of perjury, this statement to be true and correct.

_____	_____
Date	Signature of Bidder
_____	_____
	Company

A bid shall not be considered for award nor shall award be made where the foregoing certification has been complied with; provided, however, that if in any case the bidder cannot make the foregoing certification, the bidder shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefor. The **City/County of _____** may award a bid to a bidder who cannot make the certification, on case-by-case basis, if:

1. The investment activities in Iran were made before July 1, 2016, the investment activities in Iran have not been expanded or reviewed on or after July 1, 2016, and the person has adopted, publicized, and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran; or
2. The **City/County of _____**makes a determination that the goods or services are necessary for the **City/County of _____**to perform its functions and that, absent such an exemption, the political subdivision will be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

July 15, 2016

NOTICE

Tenn. Code Ann. § 12-12-106 requires the chief procurement officer to publish, using credible information freely available to the public, a list of persons it determines engage in investment activities in Iran, as described in § 12-12-105.

For these purposes, the State intends to use the attached list of "Entities Ineligible to Contract with the State of South Carolina or any Political Subdivision of the State per the Iran Divestment Act of 2014, S.C. Code Ann. §§ 11-57-10, et. seq."

While inclusion on this list would make a person ineligible to contract with the state of Tennessee, if a person ceases its engagement in investment activities in Iran, it may be removed from the list.

If you feel as though you have been erroneously included on this list please contact the Central Procurement Office at CPO.Website@tn.gov.

List Date: July 7, 2017

1. Abadan Petrochemical Co.
2. Aban Offshore Ltd.
3. Anton Oilfield Services Group
4. Arak Petrochemical
5. Arvandan Oil & Gas
6. Behran Oil Co.
7. Bharat Petroleum Corporation Ltd.
8. China International United Petroleum & Chemical So., Ltd. (Unipec)
9. China National Offshore Oil Corp
10. China National Petroleum Corp (CNPC)
11. China National United Oil Corp.
12. China Petroleum & Chemical Corp.
13. Cosmo Energy Holdings Co. Limited
14. Daelim Industrial
15. Daewoo Engineering & Construction
16. Enel Spa
17. Eni Spa
18. Esfahan Oil Refining Co.
19. Essar Oil Ltd.
20. Fanavaran Petrochemical Co.
21. Farabi Petrochemical Co.
22. Formosa Petrochemical Corp.
23. Gazprom OAO
24. Gubre Fabrikalari T.A.S.
25. Hellenic Petroleum S.A.
26. Hindustan Petroleum Corp Ltd.
27. Hyundai Heavy Industries.
28. Idemitsu Kosan Co. Ltd.
29. Indian Oil Corporation Ltd.
30. Inpex Corporation
31. Japan Drilling Co., Ltd.
32. Japan Petroleum Exploration Co., Ltd.
33. JXTG Holdings, Inc.
34. Khark Petrochemical.
35. Koc Holding A.S.
36. Korea Gas Corp.
37. Linde AG.
38. Maire Tecnimont S.p.A.
39. Mangalore Refinery & Petrochemicals Ltd.
40. Marubeni Corporation
41. Mitsubishi Materials Corp.
42. Mitsui & Co. Ltd.
43. Naftiran Intratrade Company
44. National Iranian Oil Co.
45. National Iranian South Oil Co.
46. National Iranian Tanker Co.
47. National Shipping Co. of Saudi Arabia
48. North Drilling

49. Oil & Natural Gas Corporation Ltd.
50. Oil India Ltd.
51. Oil Industry Investment Co.
52. ONGC Videsh Ltd. (OVL)
53. Pardis Petrochemical Co.
54. Pars Oil Co.
55. Parsian Oil and Gas Development Co.
56. Petrochemical Industries Investment Co.
57. Petrochemical Transport Co.
58. PetroChina Co. Ltd.
59. PJSC Lukoil
60. Polskie Gornictwo Naftowe i Gazownictwo SA
61. Royal Dutch Shell Plc.
62. Sadid Pipe & Equipments Co.
63. Saras Raffinerie Sarde SPA
64. Sepehr Energy
65. Shiraz Petrochemical Co.
66. Showa Shell Sekiyu K K
67. Sinopec Group.
68. Sk Holdings Co. Ltd.
69. SK Innovation
70. Tabriz Oil Refining Company
71. Total S.A.
72. Toyo Engineering Corporation
73. Turkiye Petrol Rafinerileri AS
74. Zhuh
75. Ai Zhenrong Company

Community Development Block Grant Program

GENERAL CONDITIONS

1. Contract and Contract Documents

The project to be constructed and pursuant to this contract will be financed with assistance from the Tennessee Community Development Block Grant Program and is subject to all applicable Federal laws and regulations.

The Plans, Specifications and Addenda, hereinafter enumerated in Paragraph 1 of the Supplemental General Conditions shall form part of this Contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The table of contents, titles, headings, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit or cast light on the interpretation of the provisions to which they refer.

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GENERAL CONDITIONS

ARTICLE 1--DEFINITIONS

Wherever used in these General Conditions or in the other Contract

Documents the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

1.1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the Bidding Requirements or the Contract Documents.

1.2. *Agreement*--The written contract between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

1.3. *Application for Payment*--The form accepted by ENGINEER which is to be used by CONTRACTOR in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

1.4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

1.5. *Bid*--The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

1.6. *Bidding Documents*--The advertisement or invitation to Bid, instructions to bidders, the Bid form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

1.7. *Bidding Requirements*--The advertisement or invitation to Bid, instructions to bidders, and the Bid form.

1.8. *Bonds*--Performance and Payment bonds and other instruments of security.

1.9. *Change Order*--A document recommended by ENGINEER, which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

1.10. *Contract Documents*--The Agreement, Addenda (which pertain to the Contract Documents). CONTRACTOR's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders and ENGINEER's written interpretations and classifications issued pursuant to paragraphs 3.5, 3.6.1, and 3.6.3 on or after the Effective Date of the Agreement. Shop Drawing submittals approved pursuant to paragraphs 6.26 and 6.27 and the reports and drawings referred to in paragraphs 4.2.1.1 and 4.2.2.2 are not Contract Documents.

1.11. *Contract Price*--The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.9.1 in the case of Unit Price Work).

1.12. *Contract Times*--The numbers of days or the dates stated in the Agreement: (i) to achieve Substantial Completion, and (ii) to complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment in accordance with paragraph 14.13.

1.13. *CONTRACTOR*--The person, firm or corporation with whom the OWNER has entered into the Agreement.

1.14. *defective*--An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER's recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with paragraph 14.8 or 14.10).

1.15. *Drawings*--The drawings which show the scope, extent and character of the Work to be furnished and performed by CONTRACTOR and which have been prepared or approved by ENGINEER and are referred to in the Contract Documents. Shop drawings are not Drawings as so defined.

1.16. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

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

1.18. *ENGINEER's Consultant*--A person, firm, or corporation having a contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

1.19. *Field Order*--A written order issued by ENGINEER which orders minor changes in the Work in accordance with paragraph 9.5 but which does not involve a change in the Contract Price or the Contract Times.

1.20. *General Requirements*--Sections of Division 1 of the Specifications.

1.21. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

1.22. *Laws and Regulations: Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

1.23. *Liens*--Liens, charges, security interests or encumbrances upon real property or personal property.

1.24. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

1.25. *Notice of Award*--The written notice by OWNER to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein, within the time specified, OWNER will sign and deliver the Agreement.

1.26. *Notice to Proceed*--A written notice given by OWNER to CONTRACTOR (with a copy to ENGINEER) fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform CONTRACTOR's obligations under the Contract Documents.

1.27. *OWNER*--The public body or authority, corporation, association, firm or person with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be provided.

1.28. *Partial Utilization*--Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

1.29. *PCBs*--Polychlorinated biphenyls.

1.30. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.

1.31. *Project*--The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

1.32. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

1.33. *Resident Project Representative*--The authorized representative of ENGINEER who may be assigned to the site or any part thereof.

1.34. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

1.35. *Shop Drawings*--All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

1.36. *Specifications*--Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

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

1.38. *Substantial Completion*--The Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER as evidenced by ENGINEER's definitive certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by ENGINEER's written recommendation of final payment in accordance with paragraph 14.13. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

1.39. *Supplementary Conditions*--The part of the Contract Documents which amends or supplements these General Conditions.

1.40. *Supplier*--A manufacturer, fabricator, supplier, distributor, materialman or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

1.41. *Underground Facilities*--All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

1.42. *Unit Price Work*--Work to be paid for on the basis of unit prices.

1.43. *Work*--The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

1.44. *Work Change Directive*--A written directive to CONTRACTOR, issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed as provided in paragraph 4.2 or 4.3 or to emergencies under paragraph 6.23. A Work Change Directive will not change the Contract Price or the Contract Times, but is evidence that the parties expect that the change directed or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times as provided in paragraph 10.2.

1.45. Written Amendment--A written amendment of the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly construction-related aspects of the Contract Documents.

ARTICLE 2--PRELIMINARY MATTERS

Delivery of Bonds:

2.1. When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds

as CONTRACTOR may be required to furnish in accordance with paragraph 5.1.

Copies of Documents:

2.2. OWNER shall furnish to CONTRACTOR up to ten copies (unless otherwise specified in the Supplementary Conditions) of the Contract Documents as are reasonably necessary for the execution of the Work. Additional copies will be furnished, upon request, at the cost of reproduction.

Commencement of Contract Times; Notice to Proceed:

2.3. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement, or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within thirty days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

Starting the Work:

2.4. CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run, but no Work shall be done at the site prior to the date on which the Contract Times commence to run.

Before Starting Construction:

2.5. Before undertaking each part of the Work, CONTRACT-OR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error, ambiguity or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error, ambiguity or discrepancy in the Contract Documents, unless CONTRACTOR knew or reasonably should have known thereof.

2.6. Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for review:

2.6.1. a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2.6.2. a preliminary schedule for Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing and processing such submittal;

2.6.3. a preliminary schedule of values for all of the Work which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.7. Before any Work at the site is started, CONTRACTOR and OWNER shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which CONTRACTOR and OWNER respectively are required to purchase and maintain in accordance with paragraphs 5.4, 5.6 and 5.7.

Preconstruction Conference:

2.8. Within twenty days after the Contract Times start to run, but before any Work at the site is started, a conference attended by CONTRACTOR, ENGINEER and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.6, procedures for handling Shop Drawings and other submittals, processing Applications for Payment and maintaining required records.

Initially Acceptable Schedules:

2.9. Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER and others as appropriate will be held to review for acceptability to ENGINEER as provided below the schedules submitted in accordance with paragraph 2.6. CONTRACTOR shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to CONTRACTOR until the schedules are submitted to and acceptable to ENGINEER as provided below. The progress schedule will be acceptable to ENGINEER as providing an orderly progression of the Work to completion within any specified Milestones and the Contract Times, but such acceptance will neither impose on ENGINEER responsibility for the sequencing, scheduling or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefore. CONTRACTOR's schedule of Shop Drawing and Sample submissions will be acceptable to ENGINEER as providing a workable arrangement for reviewing and processing the required submittals. CONTRACTOR's schedule of values will be acceptable to ENGINEER as to form and substance.

ARTICLE 3--CONTRACT DOCUMENT: INTENT, AMENDING, REUSE

Intent:

3.1. The Contract Documents comprise the entire agreement between OWNER and CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the place of the Project.

3.2. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be furnished and performed whether or not specifically called for. When words or phrases which have a well-known technical or construction industry or trade meaning are used to describe Work, materials or equipment, such words or phrases shall be interpreted in accordance with that meaning. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in paragraph 9.4.

3.3. Reference to Standards and Specifications of Technical Societies; Reporting and Resolving Discrepancies:

3.3.1. Reference to standards, specifications, manuals or codes of any technical society, organization or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code or Laws or Regulations in effect at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

3.3.2. If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the Work or of any such standard, specification, manual or code or of any instruction of any Supplier referred to in paragraph 6.5, CONTRACTOR shall report it to ENGINEER in writing at once, and, CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as authorized by paragraph 6.23) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.5 or 3.6; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

3.3.3. Except as otherwise specifically stated in the Contract Documents or as may be provided by amendment or supplement thereto issued by one of the methods indicated in paragraph 3.5 or 3.6, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity or discrepancy between the provisions of the Contract Documents and:

3.3.3.1. the provisions of any such standard, specification, manual, code or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

3.3.3.2. the provisions of any such Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

No provision of any such standard, specification, manual, code or instruction shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR or ENGINEER, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to OWNER, ENGINEER or any of ENGINEER's Consultants, agents or employees any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of paragraph 9.13 or any other provision of the Contract Documents.

3.4. 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 ENGINEER as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in 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 ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.13 or any other provision of the Contract Documents.

Amending and Supplementing Contract Documents:

3.5. The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:

3.5.1. a formal Written Amendment.

3.5.2. a Change Order (pursuant to paragraph 10.4), or

3.5.3. a Work Change Directive (pursuant to paragraph 10.1).

3.6. In addition, the requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, in one or more of the following ways:

3.6.1. a Field Order (pursuant to paragraph 9.5),

3.6.2. ENGINEER's approval of a Shop Drawing or Sample (pursuant to paragraphs 6.26 and 6.27), or

3.6.3. ENGINEER's written interpretation or clarification (pursuant to paragraph 9.4).

Reuse of Documents:

3.7. CONTRACTOR, and any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with OWNER (i) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER or ENGINEER's Consultant, and (ii) shall not reuse any of such Drawings, Specifications, other documents or copies on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaption by ENGINEER.

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

Availability of Lands:

4.1. OWNER shall furnish, as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of CONTRACTOR. Upon reasonable written request, OWNER shall furnish CONTRACTOR with a correct statement of record legal title and legal description of the lands upon which the Work is to be performed and OWNER's interest therein as necessary for giving notice of or filing a mechanic's lien against such lands in accordance with applicable Laws and Regulations. OWNER shall identify any encumbrances or restrictions not of general application but

specifically related to use of lands so furnished with which CONTRACTOR will have to comply in performing the Work. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by OWNER, unless otherwise provided in the Contract Documents. If CONTRACTOR and OWNER are unable to agree on entitlement to or the amount or extent of any adjustments in the Contract Price or the Contract Times as a result of any delay in OWNER's furnishing these lands, rights-of-way or easements, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.2. Subsurface and Physical Conditions:

4.2.1. *Reports and Drawings*: Reference is made to the Supplementary Conditions for identification of:

4.2.1.1. *Subsurface Conditions*: Those reports of explorations and tests of subsurface conditions at or contiguous to the site that have been utilized by ENGINEER in preparing the Contract Documents; and

4.2.1.2. *Physical Conditions*: Those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) that have been utilized by ENGINEER in preparing the Contract Documents.

4.2.2. *Limited Reliance by CONTRACTOR Authorized: Technical Data*: CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data." CONTRACTOR may not rely upon or make any claim against OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:

4.2.2.1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto, or

4.2.2.2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings, or

4.2.2.3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such data, interpretations, opinions or information.

4.2.3. *Notice of Differing Subsurface or Physical Conditions*: If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the site that is uncovered or revealed either:

4.2.3.1. is of such a nature as to establish that any "technical data" on which CONTRACTOR is entitled to rely as provided in paragraphs 4.2.1 and 4.2.2 is materially inaccurate, or

4.2.3.2. is of such a nature as to require a change in the Contract Documents, or

4.2.3.3. differs materially from that shown or indicated in the Contract Documents, or

4.2.3.4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then

CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as permitted by paragraph 6.23), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such conditions or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

4.2.4. *ENGINEER's Review*: ENGINEER will promptly review the pertinent conditions, determine the necessity of OWNER's obtaining additional exploration or tests with respect thereto and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER's findings and conclusions.

4.2.5. *Possible Contract Documents Change*: If ENGINEER concludes that a change in the Contract Documents is required as a result of a condition that meets one or more of the categories in paragraph 4.2.3., a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document the consequences of such change.

4.2.6. *Possible Price and Times Adjustments*: An equitable adjustment in the Contract Price or in the Contract Times, or both, will be allowed to the extent that the existence of such uncovered or revealed condition causes an increase or decrease in CONTRACTOR's cost of, or time required for performance of, the Work; subject, however, to the following:

4.2.6.1. such condition must meet any one or more of the categories described in paragraphs 4.2.3.1 through 4.2.3.4, inclusive;

4.2.6.2. a change in the Contract Documents pursuant to paragraph 4.2.5 will not be an automatic authorization of nor a condition precedent to entitlement to any such adjustment;

4.2.6.3. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of paragraphs 9.10 and 11.9; and

4.2.6.4. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Times if;

4.2.6.4.1. CONTRACTOR knew of the existence of such conditions at the time CONTRACTOR made a final commitment to OWNER in respect of Contract Price and Contract Times by the submission of a bid or becoming bound under a negotiated contract; or

4.2.6.4.2. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test or study of the site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or

4.2.6.4.3. CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.2.3.

If OWNER and CONTRACTOR are unable to agree on entitlement to or as to the amount or length of any such equitable adjustment in the Contract Price or Contract Times, a claim may be made therefore as provided in Articles 11 and 12. However, OWNER, ENGINEER and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses or damages sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.3. Physical Conditions--Underground Facilitates:

4.3.1. *Shown or Indicated*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based on information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

4.3.1.1. OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and

4.3.1.2. The cost of all of the following will be included in the Contract Price and CONTRACTOR shall have full responsibility for: (i) reviewing and checking all such information and data, (ii) locating all Underground Facilities shown or indicated in the Contract Documents, (iii) coordination of the Work with the owners of such Underground Facilities during construction, and (iv) the safety and protection of all such Underground Facilities as provided in paragraph 6.20 and repairing any damage thereto resulting from the Work.

4.3.2. *Not Shown or Indicated*: If an Underground Facility is uncovered or revealed at or contiguous to the site which was not shown or indicated in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.23), identify the owner of such Underground Facility and give written notice to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence of the Underground Facility. If ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document such consequences. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility as provided in paragraph 6.20. CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, to the extent that they are attributable to the existence of any Underground Facility that was not shown or indicated in the Contract Documents and that CONTRACTOR did not know of and could not reasonably have been expected to be aware of or to have anticipated. If OWNER and CONTRACTOR are unable to agree on entitlement to or the amount or length of any such adjustment in Contract Price or Contract Times, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12. However, OWNER, ENGINEER and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses or damages incurred or sustained by CONTRACTOR on or in connection with any other project or anticipated project.

Reference Points:

4.4. OWNER shall provide engineering surveys to establish reference points for construction which in ENGINEER's judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified personnel.

4.5. Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material:

4.5.1. OWNER shall be responsible for any Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the site. OWNER shall not be responsible for any such materials brought to the site by CONTRACTOR, Subcontractor, Suppliers or anyone else for whom CONTRACTOR is responsible.

4.5.2. CONTRACTOR shall immediately: (i) stop all Work in connection with such hazardous condition and in any area affected thereby (except in an emergency as required by paragraph 6.23), and (ii) notify OWNER and ENGINEER (and thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such hazardous condition or take corrective action, if any. CONTRACTOR shall not be required to resume Work in connection with such hazardous condition or in any such affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR special written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (ii) specifying any special conditions under which such Work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of such Work stoppage or such special conditions under which Work is agreed by CONTRACTOR to be resumed, either party may make a claim therefore as provided in Articles 11 and 12.

4.5.3. If after receipt of such special written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order such portion of the Work that is in connection with such hazardous condition or in such affected area to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a claim therefore as provided in Articles 11 and 12. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

4.5.4. To the fullest extent permitted by Laws and Regulations, OWNER shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, employees, agents, other consultants and subcontractors of each and any of them from and against all

claims, costs, losses and damages arising out of or resulting from such hazardous condition, provided that: (i) any such claim, cost, loss or damage is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting there from, and (ii) nothing in this subparagraph 4.5.4 shall obligate OWNER to indemnify any person or entity from and against the consequences of that person's or entity's own negligence.

4.5.5. The provisions of paragraphs 4.2 and 4.3 are not intended to apply to Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site.

ARTICLE 5--BONDS AND INSURANCE

Performance, Payment and Other Bonds:

5.1. CONTRACTOR shall furnish Performance and Payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary Conditions. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

5.2. If the surety on any Bond furnished by CONTRACTOR is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.1, CONTRACTOR shall within ten days thereafter substitute another Bond and surety, both of which must be acceptable to OWNER.

5.3. Licensed Sureties and Insurers; Certificates of Insurance:

5.3.1. All Bonds and insurance required by the Contract Documents to be purchased and maintained by OWNER or CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue Bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.3.2. CONTRACTOR shall deliver to OWNER, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by OWNER or any other additional insured) which CONTRACTOR is required to purchase and maintain in accordance with paragraph 5.4. OWNER shall deliver to CONTRACTOR, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by CONTRACTOR or any other additional insured) which OWNER is required to purchase and maintain in accordance with paragraphs 5.6 and 5.7 hereof.

CONTRACTOR's Liability Insurance:

5.4. CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and furnished and as will provided protection from claims set forth below which may arise out of or result from CONTRACTOR's performance and furnishing of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed or furnished by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or by anyone for whose acts any of them may be liable:

5.4.1. claims under workers' compensation, disability benefits and other similar employee benefit acts;

5.4.2. claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;

5.4.3. claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;

5.4.4. claims for damages insured by customary personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR , or (ii) by any other person for any other reason;

5.4.5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting there from; and

5.4.6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

The policies of insurance so required by this paragraph 5.4 to be purchased and maintained shall:

5.4.7. with respect to insurance required by paragraphs 5.4.3. through 5.4.6 inclusive, include as additional insured (subject to any customary exclusion in respect of professional liability) OWNER, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insured, and include coverage for the respective officers and employees of all such additional insured;

5.4.8. include the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

5.4.9. include completed operations insurance;

5.4.10. include contractual liability insurance covering CONTRACTOR's indemnity obligations under paragraphs 6.12, 6.16 and 6.31 through 6.33;

5.4.11. contain a provision or endorsement that the coverage afforded will not be cancelled, materially changed or renewal refused until at least thirty days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the CONTRACTOR pursuant to paragraph 5.3.2 will so provide);

5.4.12. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing or replacing *defective* Work in accordance with paragraph 13.12; and

5.4.13. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and CONTRACTOR shall furnish OWNER and each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued evidence satisfactory to OWNER and any such additional insured of continuation of such insurance at final payment and one year thereafter).

OWNER's Liability Insurance:

5.5. In addition to the insurance required to be provided by CONTRACTOR under paragraph 5.4, OWNER, at OWNER's option, may purchase and maintain at OWNER's expense OWNER's own liability insurance as will protect OWNER against claims which may arise from operations under the Contract Documents.

Property Insurance:

5.6. Unless otherwise provided in the Supplementary Conditions, OWNER shall purchase and maintain property insurance upon the Work at the site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

5.6.1. include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

5.6.2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work and Work in transit and shall insure against at least the following perils fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils as may be specifically required by the Supplementary Conditions;

5.6.3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

5.6.4. cover materials and equipment stored at the site or at another location that was agreed to in writing by OWNER prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by ENGINEER; and

5.6.5. be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR and ENGINEER with thirty days written notice to each other additional insured to whom a certificate of insurance has been issued.

5.7. OWNER shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

5.8. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained by OWNER in accordance with paragraphs 5.6 and 5.7 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least thirty days' prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.11.

5.9. OWNER shall not be responsible for purchasing and maintaining any property insurance to protect the interests of CONTRACTOR, Subcontractors or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount, will be borne by CONTRACTOR, Subcontractor or others suffering any such loss and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.10. If CONTRACTOR requests in writing that other special insurance be included in the property insurance policies provided under paragraphs 5.6 or 5.7, OWNER shall, if possible, include such insurance, and the cost thereof will be charged to CONTRACTOR by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the site, OWNER shall in writing advise CONTRACTOR whether or not such other insurance has been procured by OWNER.

5.11. Waiver of Rights:

5.11.1. OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraphs 5.6 and 5.7 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds in such policies and will provide primary coverage for all losses and damages caused by the perils covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. OWNER and CONTRACTOR waive all rights against each other and their respective officers, directors, employees and agents for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER's Consultants and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds under such policies for losses and damages so caused. None of the above waivers shall extend to the

rights that any party making such waiver may have to the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

5.11.2. In addition, OWNER waives all rights against CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, employees and agents of any of them, for:

5.11.2.1. loss due to business interruption, loss of use or other consequential loss extending beyond direct physical loss or damage to OWNER's property or the Work caused by, arising out of or resulting from fire or other peril, whether or not insured by OWNER; and

5.11.2.2. loss or damage to the completed Project or part thereof caused by, arising out of or resulting from fire or other insured peril covered by any property insurance maintained on the completed Project or part thereof by OWNER during partial utilization pursuant to paragraph 14.10, after substantial completion pursuant to paragraph 14.8 or after final payment pursuant to paragraph 14.13.

Any insurance policy maintained by OWNER covering any loss, damage or consequential loss referred to in this paragraph 5.11.2 shall contain provisions to the effect that in the event of payment of any such loss, damage or consequential loss the insurers will have no rights of recovery against any of CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, employees and agents of any of them.

Receipt and Application of Insurance Proceeds

5.12. Any insured loss under the policies of insurance required by paragraphs 5.6 and 5.7 will be adjusted with OWNER and made payable to OWNER as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.13. OWNER shall deposit in a separate account any money so received, and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

5.13. OWNER as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within fifteen days after the occurrence of loss to OWNER's exercise of this power. If such objection be made, OWNER as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, OWNER as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, OWNER as fiduciary shall give bond for the proper performance of such duties.

Acceptance of Bonds and Insurance; Option to Replace;

5.14. If either party (OWNER or CONTRACTOR) has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within ten days after receipt of the certificates (or other evidence requested) required by paragraph 2.7. OWNER and CONTRACTOR shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the Bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work , or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent Bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

Partial Utilization--Property Insurance:

5.15. If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with paragraph 14.10; provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be cancelled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6--CONTRACTOR'S RESPONSIBILITIES

Supervision and Superintendence:

6.1. CONTRACTOR shall supervise, inspect and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of others in the design or specification of a specific means, method, technique, sequence or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

6.2. CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the site and shall have authority to act on behalf of CONTRACTOR. All communications to the superintendent shall be as binding as if given to CONTRACTOR.

Labor, Materials and Equipment:

6.3. CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out and construct the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the site. Except as otherwise required for the safety or protection of persons or the Work or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed during regular working hours and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without OWNER's written consent given after prior written notice to ENGINEER.

6.4. Unless otherwise specified in the General Requirements, CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

6.5. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of OWNER. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

Progress Schedule:

6.6. CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.9 as it may be adjusted from time to time as provided below:

6.6.1. CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.9) proposed adjustments in the progress schedule that will not change the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

6.6.2. Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of paragraph 12.1. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

6.7. Substitutes and "Or-Equal" Items:

6.7.1. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be accepted by ENGINEER under the following circumstances:

6.7.1.1. *"Or-Equal"*: If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for acceptance of proposed substitute items.

6.7.1.2. *Substitute Items:* If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under subparagraph 6.7.1.1., it will be considered a proposed substitute item. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. The procedure for review by the ENGINEER will include the following as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances. Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall first make written application to ENGINEER for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified and be suited to the same use as that specified. The application will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by ENGINEER in evaluating the proposed substitute. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute.

6.7.1.3. *CONTRACTOR's Expense:* All data to be provided by CONTRACTOR in support of any proposed "or-equal" or substitute item will be at CONTRACTOR's expense.

6.7.2. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence or procedure of construction acceptable to ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in subparagraph 6.7.1.2.

6.7.3. *Engineer's Evaluation:* ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.7.1.2 and 6.7.2. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized without ENGINEER's prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any "or-equal" or substitute. ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in

evaluating substitutes proposed or submitted by CONTRACTOR pursuant to paragraphs 6.7.1.2 and 6.7.2 and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER accepts a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluating each such proposed substitute item.

Concerning Subcontractors, Suppliers and Others:

6.8.1. CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including those acceptable to OWNER and ENGINEER as indicated in paragraph 6.8.2), whether initially or as a substitute, against whom OWNER or ENGINEER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

6.8.2. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers or other persons or organization (including those who are to furnish the principal items of materials or equipment) to be submitted to OWNER in advance of the specified date prior to the Effective Date of the Agreement for acceptance by OWNER and ENGINEER, and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's or ENGINEER's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the bidding documents or the Contract Documents) of any such Subcontractor, Supplier or other person or organization so identified may be removed on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable substitute, the Contract Price will be adjusted by the difference in the cost occasioned by such substitution and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER or ENGINEER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of OWNER or ENGINEER to reject *defective* Work.

6.9.1. CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier or other person or organization any contractual relationship between OWNER and ENGINEER and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Laws and Regulations.

6.9.2. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR. CONTRACTOR shall require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with the ENGINEER through CONTRACTOR.

6.10. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

6.11. All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.6 or 5.7, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, ENGINEER, ENGINEER's Consultants and all other additional insureds for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

Patent Fees and Royalties:

6.12. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages arising out of or resulting from any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents.

Permits:

6.13. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto such as plant investment fees.

Laws and Regulations:

6.14.1. CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to furnishing and performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

6.14.2. If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses and damages caused by, arising out of or resulting there from; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve CONTRACTOR or CONTRACTOR's obligations under paragraph 3.3.2.

Taxes:

6.15. CONTRACTOR shall pay all sales, consumer, use and other similar taxes required to be paid by CONTRACTOR in accordance with Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

Use of Premises:

6.16. CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by Laws and Regulations, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any adjacent land or areas, resulting from the performance of the Work. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant and anyone directly or indirectly employed by any of them from and against all claims, costs, losses and damages arising out of or resulting from any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, ENGINEER or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

6.17. During the progress of the Work, CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work CONTRACTOR shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery and surplus materials. CONTRACTOR shall leave the site clean and ready for occupancy by OWNER at Substantial Completion of the Work. CONTRACTOR shall restore to original condition all property not designated for alteration by the Contract Documents.

6.18. CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

Record Documents:

6.19. CONTRACTOR shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders and written interpretations and clarifications (issued pursuant to paragraph 9.4) in good order and annotated to show all changes made during construction. These record documents together with all approved Samples and a counter part of all approved Shop Drawings will be available to ENGINEER for reference. Upon completion of the Work, these record documents, Samples and Shop Drawings will be delivered to ENGINEER for OWNER.

Safety and Protection:

6.20. 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:

6.20.1. all persons on the Work site or who may be affected by the Work;

6.20.2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and

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

CONTRACTOR shall comply with all applicable Laws and Regulations of any public body having jurisdiction for safety of persons or property or to protect them 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 6.20.2 or 6.20.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, 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 liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of OWNER or ENGINEER or ENGINEER's Consultant or anyone employed by any of them or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any Subcontractor, Supplier or other person or organization directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.13 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

Safety Representative:

6.21. CONTRACTOR shall designate a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

Hazard Communication Program:

6.22. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the site in accordance with Laws or Regulations.

Emergencies:

6.23. 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 OWNER or ENGINEER, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If ENGINEER determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Work Change Directive or Change Order will be issued to document the consequences of such action.

6.24. ***Shop Drawings and Samples:***

6.24.1. CONTRACTOR shall submit Shop Drawings to ENGINEER for review and approval in accordance with the accepted schedule of Shop Drawings and Sample submittals (see paragraph 2.9). All submittals will be identified as ENGINEER may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to show ENGINEER the materials and equipment CONTRACTOR proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.26.

6.24.2. CONTRACTOR shall also submit Samples to ENGINEER for review and approval in accordance with said accepted schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.26. The numbers of each Sample to be submitted will be as specified in the Specifications.

6.25. ***Submittal Procedures:***

6.25.1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

6.25.1.1. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto.

6.25.1.2. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to the performance of the Work, and

6.25.1.3. all information relative to CONTRACTOR's sole responsibilities in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.

CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

6.25.2. Each submittal will bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and approval of that submittal.

6.25.3. At the time of each submission, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawings or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to ENGINEER for review and approval of each such variation.

6.26. ENGINEER will review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals accepted by ENGINEER as required by paragraph 2.9. ENGINEER's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed project as a functioning whole as indicated by the Contract Documents. ENGINEER's review and approval will not extend to means, methods, techniques, sequences or procedures of construction (except where particular means, method, technique, sequence or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. CONTRACTOR shall make corrections required by ENGINEER, and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

6.27. ENGINEER's review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of submission as required by paragraph 6.25.3 and ENGINEER has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.25.1.

6.28. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submissions accepted by ENGINEER as required by paragraph 2.9, any related Work performed prior to ENGINEER's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

Continuing the Work:

6.29. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.5 or as OWNER and CONTRACTOR may otherwise agree in writing.

6.30. ***CONTRACTOR's General Warranty and Guarantee***

6.30.1. CONTRACTOR warrants and guarantees to OWNER, ENGINEER and ENGINEER's Consultants that all Work will be in accordance with the Contract Documents and will not be *defective*. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

6.30.1.1. abuse, modification or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors or Suppliers; or

6.30.1.2. normal wear and tear under normal usage.

6.30.2. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

6.30.2.1. observations by ENGINEER;

6.30.2.2. recommendation of any progress or final payment by ENGINEER;

6.30.2.3. the issuance of a certificate of Substantial Completion or any payment by OWNER to CONTRACTOR under the Contract Documents;

6.30.2.4. use or occupancy of the Work or any part thereof by OWNER;

6.30.2.5. any acceptance by OWNER or any failure to do so;

6.30.2.6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER pursuant to paragraph 14.13;

6.30.2.7. any inspection, test or approval by others; or

6.30.2.8. any correction of *defective* Work by OWNER.

Indemnification:

6.31. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting from the performance of the Work, provided that any such claim, cost, loss or damage: (i) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting there from, and (ii) is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, any 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 liable, regardless of whether or not caused in part by any negligence or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such person or entity.

6.32. In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, any 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 liable, the indemnification obligation under paragraph 6.31 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for CONTRACTOR or any such Subcontractor, Supplier or other person or organization under workers' compensation acts, disability benefit acts or other employee benefit acts.

6.33. The indemnification obligations of CONTRACTOR under paragraph 6.31 shall not extend to the liability of ENGINEER and ENGINEER's Consultants, officers, directors, employees or agents caused by the professional negligence errors or omissions of any of them.

Survival of Obligations:

6.34. All representatives, indemnifications, warranties and guarantees made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the Work and termination or completion of the Agreement.

ARTICLE 7--OTHER WORK

Related Work at Site:

7.1. OWNER may perform other work related to the Project at the site by OWNER's own forces, or let other direct contracts therefore which shall contain General Conditions similar to these, or have other work performed by utility owners. If the fact that such other work is to be performed was not noted in the Contract Documents, then: (i) written notice thereof will be given to CONTRACTOR prior to starting any such other work, and (ii) CONTRACTOR may make a claim therefore as provided in Articles 11 and 12 if CONTRACTOR believes that such performance will involve additional expense to CONTRACTOR or requires additional time and the parties are unable to agree as to the amount or extent thereof.

7.2. CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and OWNER, if OWNER is performing the additional work with OWNER's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct contracts between OWNER and such utility owners and other contractors.

7.3. If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to ENGINEER in writing any delays, defects or deficiencies in such other work that render it unavailable or unsuitable

for the proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure so to report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work except for latent or nonapparent defects and deficiencies in such other work.

Coordination:

7.4. If OWNER contracts with others for the performance of other work on the Project at the site, the following will be set forth in Supplementary Conditions:

7.4.1. the person, firm or corporation who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified;

7.4.2. the specific matters to be covered by such authority and responsibility will be itemized; and

7.4.3. the extent of such authority and responsibilities will be provided.

Unless otherwise provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility in respect of such coordination.

ARTICLE 8--OWNER'S RESPONSIBILITIES

8.1. Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.2. In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer against whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER.

8.3. OWNER shall furnish the data required of OWNER under the Contract Documents promptly and shall make payments to CONTRACTOR promptly when they are due as provided in paragraphs 14.4 and 14.13.

8.4. OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.1 and 4.4. Paragraph 4.2 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions at the site and drawings of physical conditions in existing structures at or contiguous to the site that have been utilized by ENGINEER in preparing the Contract Documents.

8.5. OWNER's responsibilities in respect of purchasing and maintaining liability and property insurance are set forth in paragraphs 5.5 through 5.10.

8.6. OWNER is obligated to execute Change Orders as indicated in paragraph 10.4.

8.7. OWNER's responsibility in respect of certain inspections, tests and approvals is set forth in paragraph 13.4.

8.8. In connection with OWNER's right to stop Work or suspend Work, see paragraphs 13.10 and 15.1. Paragraph 15.2 deals with OWNER's right to terminate services of CONTRACTOR under certain circumstances.

8.9. The OWNER shall not supervise, direct or have control or authority over, nor be responsible for, CONTRACTOR's means, methods, techniques, sequences or procedures of construction or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work. OWNER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

8.10. OWNER's responsibility in respect of undisclosed Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Materials uncovered or revealed at the site is set forth in paragraph 4.5.

8.11. If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract Documents, OWNER's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9--ENGINEER'S STATUS DURING CONSTRUCTION

OWNER's Representative:

9.1. ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and shall not be extended without written consent of OWNER and ENGINEER.

Visits to Site:

9.2. ENGINEER will make visits to the site at intervals appropriate to the various stages of construction as ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and observations, ENGINEER will endeavor for the benefit of OWNER to determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and on-site observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against *defective* Work. ENGINEER's visits and on-site observations are subject to all the limitations on ENGINEER's authority and responsibility set forth in paragraph 9.13, and particularly, but without limitation, during or as a result of ENGINEER's on-site visits or observations of CONTRACTOR's Work ENGINEER will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work.

Project Representative:

9.3. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in providing more continuous observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.13 and in the Supplementary Conditions. If OWNER designates another representative or agent to represent OWNER at the site who is not ENGINEER's Consultant, agent or employee, the responsibilities and authority and limitations thereon of such other person will be as provided in the Supplementary Conditions.

Clarifications and Interpretations:

9.4. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from Contract Documents. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER or CONTRACTOR believes that a written clarification or interpretation justifies an adjustment in the Contract Price or the Contract Times and the parties are unable to agree to the amount or extent thereof, if any, OWNER or CONTRACTOR may make a written claim therefore as provided in Article 11 or Article 12.

Authorized Variations in Work:

9.5. ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER and also on CONTRACTOR who shall perform the Work involved promptly. If OWNER or CONTRACTOR believes that a Field Order justifies an adjustment in the Contract Price or the Contract Times and the parties are unable to agree as to the amount or extent thereof, OWNER or CONTRACTOR may make a written claim therefore as provided in Article 11 or 12.

Rejecting Defective Work:

9.6. ENGINEER will have authority to disapprove or reject Work which ENGINEER believes to be *defective*, or that ENGINEER believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER will also have authority to require special inspection or testing of the Work as provided in paragraph 13.9, whether or not the Work is fabricated, installed or completed.

Shop Drawings, Change Orders and Payments:

9.7. In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraphs 6.24 through 6.28 inclusive.

9.8. In connection with ENGINEER's authority as to Change Orders, see Articles 10, 11, and 12.

9.9. In connection with ENGINEER's authority as to Applications for Payment, see Article 14.

Determinations for Unit Price:

9.10. ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR the ENGINEER's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). ENGINEER's written decision thereon will be final and binding upon OWNER and CONTRACTOR, unless, within ten days after the date of any such decision, either OWNER or CONTRACTOR delivers to the other and to ENGINEER written notice of intention to appeal from ENGINEER's decision and: (i) an appeal from ENGINEER's decision is taken within the time limits and in accordance with the procedures set forth in Exhibit GC-A, "Dispute Resolution Agreement," entered into between OWNER and CONTRACTOR pursuant to Article 16, or (ii) if no such Dispute Resolution Agreement has been entered into, a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to ENGINEER's decision, unless otherwise agreed in writing by OWNER and CONTRACTOR. Such appeal will not be subject to the procedures of paragraph 9.11.

Decisions on Disputes:

9.11. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work and Claims under Articles 11 and 12 in respect of changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing with a request for a formal decision in accordance with this paragraph. Written notice of each such claim, dispute or other matter will be delivered by the claimant to ENGINEER and the other party to the Agreement promptly (but in no event later than thirty days) after the start of the occurrence or event giving rise thereto, and written supporting data will be submitted to ENGINEER and the other party within sixty days after the start of such occurrence or event unless ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of such claim, dispute or other matter. The opposing party shall submit any response to ENGINEER and the claimant within thirty days after receipt of the claimant's last submittal (unless ENGINEER allows additional time). ENGINEER will render a formal decision in writing within thirty days after receipt of the opposing party's submittal, if any, in accordance with this paragraph. ENGINEER's written decision on such claim, dispute or other matter will be final and binding upon OWNER and CONTRACTOR unless: (i) an appeal from ENGINEER's decision is taken within the time limits and in accordance with the procedures set forth in EXHIBIT GC-A, "Dispute Resolution Agreement," entered into between OWNER and CONTRACTOR pursuant to Article 16, or (ii) if no such Dispute Resolution Agreement has been entered into, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within thirty days after the date of such decision and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to such claim, dispute or other matter in accordance with applicable Laws and Regulations within sixty days of the date of such decision, unless otherwise agreed in writing by OWNER and CONTRACTOR.

9.12. When functioning as interpreter and judge under paragraphs 9.10 and 9.11, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to paragraphs 9.10 or

9.11 with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.16) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such claim, dispute or other matter pursuant to Article 16.

9.13. Limitations on ENGINEER's Authority and Responsibilities:

9.13.1. Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise or performance of any authority or responsibility by ENGINEER shall create, impose or give rise to any duty owed by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them.

9.13.2. ENGINEER will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work. ENGINEER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

9.13.3. ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

9.13.4. ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds and certificates of inspection, tests and approvals and Other documentation required to be delivered by paragraph 14.12 will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests and approvals that the results certified indicate compliance with, the Contract Documents.

9.13.5. The limitations upon authority and responsibility set forth in this paragraph 9.13 shall also apply to ENGINEER's Consultants, Resident Project Representative and assistants.

ARTICLE 10--CHANGES IN THE WORK

10.1. Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions or revisions in the Work. Such additions, deletions or revisions will be authorized by a Written Amendment, a Change Order, or a Work Change Directive. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

10.2. If OWNER and CONTRACTOR are unable to agree as to the extent, if any, of an adjustment in the Contract Price or an adjustment of the Contract Times that should be allowed as a result of a Work Change Directive, a claim may be made therefore as provided in Article 11 or Article 12.

10.3. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in paragraphs 3.5 and 3.6 except in the case of any emergency as provided in paragraph 6.23 or in the case of uncovering Work as provided in paragraph 13.9.

10.4. OWNER and CONTRACTOR shall execute appropriate Change Orders recommended by ENGINEER (or Written Amendments) covering:

10.4.1. changes in the Work which are (i) ordered by OWNER pursuant to paragraph 10.1, (ii) required because of acceptance of *defective* Work under paragraph 13.13 or correcting *defective* Work under paragraph 13.14, or (iii) agreed to by the parties;

10.4.2. changes in the Contract Price or Contract Times which are agreed to by the parties; and

10.4.3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 9.11;

provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in paragraph 6.29.

10.5. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility, and the amount of each applicable Bond will be adjusted accordingly.

ARTICLE 11--CHANGE OF CONTRACT PRICE

11.1. The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR shall be at CONTRACTOR's expense without change in the Contract Price.

11.2. The Contract Price may only be changed by a Change Order or by a Written Amendment. Any claim for an adjustment in the Contract Price shall be based on written notice delivered by the party making the claim to the other party and to ENGINEER promptly (but in no event later than thirty days) after the start of the occurrence or event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within sixty days after the start of such occurrence or event (unless ENGINEER allows additional time for claimant to submit additional or more accurate data in support of the claim) and shall be accompanied by claimant's written statement that the adjustment claimed covers all known amounts to which the claimant is entitled as a result of said occurrence or event. All claims for adjustment in the Contract Price shall be determined by ENGINEER in accordance with paragraph 9.11 if OWNER and CONTRACTOR cannot otherwise

agree on the amount involved. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this paragraph 11.2.

11.3. The value of any Work covered by a Change Order or of any claim for an adjustment in the Contract Price will be determined as follows:

11.3.1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of paragraphs 11.9.1 through 11.9.3, inclusive);

11.3.2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 11.6.2);

11.3.3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 11.3.2, on the basis of the Cost of the Work (determined as provided in paragraphs 11.4 and 11.5) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 11.6).

Cost of the Work:

11.4. The term Cost of the Work means the sum of all costs necessarily incurred and paid by Contractor in the proper performance of the Work. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amount no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in paragraph 11.5:

11.4.1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Such employees shall include without limitation superintendents, foremen and other personnel employed full-time at the site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work after regular working hours, on Saturday, Sunday or legal holidays, shall be included in the above to the extent authorized by OWNER.

11.4.2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

11.4.3. Payments made by CONTRACTOR to the Subcontractors for Work performed or furnished by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER who will then determine, with the advice of ENGINEER, which bids, if any, will be accepted. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in paragraphs 11.4, 11.5, 11.6 and 11.7. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

11.4.4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys and accountants) employed for services specifically related to the Work.

11.4.5. Supplemental costs including the following:

11.4.5.1. The proportion of necessary transportation, travel and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

11.4.5.2. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of CONTRACTOR.

11.4.5.3. Rentals of all construction equipment and machinery and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, installation, dismantling and removal thereof--all in accordance with the terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

11.4.5.4. Sales, consumer, use or similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

11.4.5.5. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

11.4.5.6. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance and furnishing of the Work (except losses and damages within the deductible amounts of property insurance established by OWNER in accordance with paragraph 5.9), provided they have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is

placed in charge thereof, CONTRACTOR shall be paid for services a fee proportionate to that stated in paragraph 11.6.2.

11.4.5.7. The cost of utilities, fuel and sanitary facilities at the site.

11.4.5.8. Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

11.4.5.9. Cost of premiums for additional Bonds and insurance required because of changes in the Work.

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

11.5.1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the site or in CONTRACTOR's principal or a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.4.1. or specifically covered by paragraph 11.4.4--all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

11.5.2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the site.

11.5.3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

11.5.4. Cost of premiums for all Bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except for the cost of premiums covered by subparagraph 11.4.5.9 above).

11.5.5. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of *defective* Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

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

11.6. The CONTRACTOR's fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:

11.6.1. a mutually acceptable fixed fee

11.7. Whenever the cost of any Work is to be determined pursuant to paragraphs 11.4 and 11.5, CONTRACTOR will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

Cash Allowance:

11.8. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be furnished and performed for such sums as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees that:

11.8.1. the allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the site, and all applicable taxes; and

11.8.2. CONTRACTOR's cost for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances and no demand for additional payment on account of any of the foregoing will be valid.

Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.9. ***Unit Price Work:***

11.9.1. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER in accordance with paragraph 9.10.

11.9.2. Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

11.9.3. OWNER or CONTRACTOR may make a claim for an adjustment in the Contract Price in accordance with Article 11 if:

11.9.3.1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

11.9.3.2. there is no corresponding adjustment with respect to any other item of Work; and

11.9.3.3. if CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12--CHANGE OF CONTRACT TIMES

12.1. The Contract Times (or Milestones) may only be changed by a Change Order or a Written Amendment. Any claim for an adjustment of the Contract Times (or Milestones) shall be based on written notice delivered by the party making the claim to the other party and to ENGINEER promptly (but in no event later than thirty days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within sixty days after such occurrence (unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Times (or Milestones) shall be determined by ENGINEER in accordance with paragraph 9.11 if OWNER and CONTRACTOR cannot otherwise agree. No claim for an adjustment in the Contract Times (or Milestones) will be valid if not submitted in accordance with the requirements of this paragraph 12.1.

12.2. All time limits stated in the Contract Documents are of the essence of the Agreement.

12.3. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a claim is made therefore as provided in paragraph 12.1. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions or acts of God. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.4. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay. In no event shall OWNER be liable to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from (i) delays caused by or within the control of CONTRACTOR, or (ii) delays beyond the control of both parties including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

ARTICLE 13--TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF *DEFECTIVE* WORK

13.1. *Notice of Defects*: Prompt notice of all *defective* Work of which OWNER or ENGINEER have actual knowledge will be given to CONTRACTOR. All *defective* Work may be rejected, corrected or accepted as provided in this Article 13.

Access to Work:

13.2. OWNER, ENGINEER, ENGINEER's Consultants, other representatives and personnel of OWNER, independent testing laboratories and governmental agencies with jurisdiction interests will have access to the Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's site safety procedures and programs so that they may comply therewith as applicable.

Tests and Inspections:

13.3. CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

13.4. OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

13.4.1. for inspections, tests or approvals covered by paragraph 13.5 below;

13.4.2. that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.9 below shall be paid as provided in said paragraph 13.9; and

13.4.3. as otherwise specifically provided in the Contract Documents.

13.5. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or approvals, pay all costs in connection therewith, and furnish ENGINEER the required certificates of inspection, or approval. CONTRACTOR shall also be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for OWNER's and ENGINEER's acceptance of materials or equipment to be incorporated in the Work, or of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work.

13.6. If any Work (or the work of others) that is to be inspected, tested or approved is covered by CONTRACTOR without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation.

13.7. Uncovering Work as provided in paragraph 13.6 shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

Uncovering Work:

13.8. If any Work is covered contrary to the written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's expense.

13.9. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose or otherwise make available for observation, inspection or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is *defective*, CONTRACTOR shall pay all claims, costs, losses and damages caused by, arising out of or resulting from such uncovering, exposure, observation, inspection and testing and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, may make a claim therefore as provided in Article 11. If, however, such Work is not found to be *defective*, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement and reconstruction; and, if the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12.

OWNER May Stop the Work:

13.10. If the Work is *defective*, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any surety or other party.

Correction or Removal of Defective Work:

13.11. If required by ENGINEER, CONTRACTOR shall promptly, as directed, either correct all *defective* Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by ENGINEER, remove it from the site and replace it with Work that is not *defective*. CONTRACTOR shall pay all claims, costs, losses and damages caused by or resulting from such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.12. ***Correction Period:***

13.12.1. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be *defective*, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions: (i) correct such *defective* Work, or, if it has been rejected by OWNER, remove it from the site and replace it with Work that is not *defective*, and (ii) satisfactorily correct or remove and replace any damage to other Work or the work of others resulting there from. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the *defective* Work corrected or the rejected Work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

13.12.2. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

13.12.3. Where *defective* Work (and damage to other Work resulting there from) has been corrected, removed or replaced under this paragraph 13.12, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

Acceptance of Defective Work:

13.13. If, instead of requiring correction or removal and replacement of *defective* Work OWNER (and, prior to ENGINEER's recommendation of final payment, also ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall pay all claims, costs, losses and damages attributable to OWNER's evaluation of and determination to accept such *defective* Work (such costs to be approved by ENGINEER as to reasonableness). If any such acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, OWNER may make a claim therefore as provided in Article 11. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

OWNER May Correct Defective Work:

13.14. If CONTRACTOR fails within a reasonable time after written notice from ENGINEER to correct *defective* Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.11, of if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven days' written notice to CONTRACTOR, correct and remedy any such deficiency. In exercising the rights and remedies under this paragraph OWNER shall proceed expeditiously. In connection with such corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors and ENGINEER and ENGINEER's Consultants access to the site to enable OWNER to

exercise the rights and remedies under this paragraph. All claims, costs, losses and damages incurred or sustained by OWNER in exercising such rights and remedies will be charged against CONTRACTOR and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, OWNER may make a claim therefore as provided in Article 11. Such claims, costs, losses and damages will include but not be limited to all costs of repair or replacement of work of others destroyed or damaged by correction, removal or replacement of CONTRACTOR's *defective* Work. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies hereunder.

ARTICLE 14--PAYMENTS TO CONTRACTOR AND COMPLETION

Schedule of Values:

14.1. The schedule of values established as provided in paragraph 2.9 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

Application for Progress Payment

14.2. At least twenty days before the date established for each progress payment (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that OWNER has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect OWNER's interest therein, all of which will be satisfactory to OWNER. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

CONTRACTOR's Warranty of Title:

14.3. CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

Review of Applications for Progress Payment:

14.5. ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's on-site observations of the executed Work as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules, that to the best of ENGINEER's knowledge, information and belief:

14.5.1. the Work has progressed to the point indicated.

14.5.2. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.10, and to any other qualifications stated in the recommendation), and

14.5.3. the conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled in so far as it is ENGINEER's responsibility to observe the Work.

However, by recommending any such payment ENGINEER will not thereby be deemed to have represented that: (i) exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents or (ii) that there may not be other matters or issues between the parties that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

14.6. ENGINEER's recommendation of any payment, including final payment, shall not mean that ENGINEER is responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of Work, or for any failure of CONTRACTOR to perform or furnish Work in accordance with the Contract Documents.

14.7. ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make the representations to OWNER referred to in paragraph 14.5. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

14.7.1. the Work is *defective*, or completed Work has been damaged requiring correction or replacement,

14.7.2. the Contract Price has been reduced by Written Amendment or Change Order,

14.7.3. OWNER has been required to correct *defective* Work or complete Work in accordance with paragraph 13.14, or

14.7.4. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 15.2.1 through 15.2.4 inclusive.

OWNER may refuse to make payment of the full amount recommended by ENGINEER because:

14.7.5. claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work,

14.7.6. Liens have been filed in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens.

14.7.7. there are other items entitling OWNER to a set-off against the amount recommended, or

14.7.8. OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.71. through 14.7.3 or paragraphs 15.2.1 through 15.2.4 inclusive;

but OWNER must have CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction the reasons for such action.

Substantial Completion:

14.8. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Within a reasonable time thereafter, OWNER, CONTRACTOR and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefore. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have seven days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within fourteen days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefore. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said fourteen days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion, ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

14.9. OWNER shall have the right to exclude CONTRACTOR from the Work after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

Partial Utilization:

14.10. Use by OWNER at OWNER's option of any substantially completed part of the Work which: (i) has specifically been identified in the Contract Documents, or (ii) OWNER, ENGINEER and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following:

14.10.1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER that such part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, OWNER, CONTRACTOR and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving the reasons therefore. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraphs 14.8 and 14.9 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

14.10.2. No occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of paragraph 5.15 in respect of property insurance.

Final Inspection:

14.11. Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, ENGINEER will make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or *defective*. CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

Final Application for Payment:

14.12. After CONTRACTOR has completed all such corrections to the satisfaction of ENGINEER and delivered in accordance with the Contract Documents all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance required by paragraph 5.4, certificates of inspection, marked-up record documents (as provided in paragraph 6.19) and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by subparagraph 5.4.13, (ii) consent of the surety, if any, to final payment, and (iii) complete and legally effective releases or waivers (satisfactory to OWNER) of all Liens arising out of or filed in connection with the Work. In lieu of such releases or waivers of Liens and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full and an affidavit of CONTRACTOR that: (i) the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and (ii) all payrolls, material and equipment bills and other indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

Final Payment and Acceptance:

14.13. If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will, within ten days after receipt of the final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application to OWNER for payment. At the same time ENGINEER will also give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.15. Otherwise, ENGINEER will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application.

14.14. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.1, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

Waiver of Claims:

14.15. The making and acceptance of final payment will constitute:

14.15.1. a waiver of all claims by OWNER against CONTRACTOR, except claims arising from unsettled Liens, from *defective* Work appearing after final inspection pursuant to paragraph 14.11, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

14.15.2. a waiver of all claims by CONTRACTOR against OWNER other than those previously made in writing and still unsettled.

ARTICLE 15--SUSPENSION OF WORK AND TERMINATION

OWNER May Suspend Work:

15.1. At any time and without cause, OWNER may suspend the Work, or any portion thereof for a period of not more than ninety days by notice in writing to CONTRACTOR and ENGINEER which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR shall be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR makes an approved claim therefore as provided in Articles 11 and 12.

OWNER May Terminate:

15.2. Upon the occurrence of any one or more of the following events:

15.2.1. if CONTRACTOR persistently fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.9 as adjusted from time to time pursuant to paragraph 6.6);

15.2.2. if CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;

15.2.3. if CONTRACTOR disregards the authority of ENGINEER; or

15.2.4. if CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents;

OWNER may, after giving CONTRACTOR (and the surety, if any,) seven days' written notice and to the extent permitted by Laws and Regulations, terminate the services of CONTRACTOR, exclude CONTRACTOR from the site and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which Owner has paid CONTRACTOR but which are stored elsewhere, and finish the Work as OWNER may deem expedient. In such case CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses and damages sustained by OWNER arising out of or resulting from completing the Work such excess will be paid to CONTRACTOR. If such claims, costs, losses and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses and damages incurred by

OWNER will be reviewed by ENGINEER as to their reasonableness and when so approved by ENGINEER incorporated in a Change Order, provided that when exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

15.3. Where CONTRACTOR's services have been so terminated by OWNER, the termination will not affect any rights or remedies of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of monies due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

15.4. Upon seven day's written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Agreement. In such case, CONTRACTOR shall be paid (without duplication of any items);

15.4.1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

15.4.2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

15.4.3. for all claims, costs, losses and damages incurred in settlement of terminated contracts with Subcontractors, Suppliers and others; and

15.4.4. for reasonable expenses directly attributable to termination.

CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

CONTRACTOR May Stop Work or Terminate:

15.5. If, through no act or fault of CONTRACTOR, the Work is suspended for a period of more than ninety days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application of Payment within thirty days after it is submitted or OWNER fails for thirty days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days' written notice to OWNER and ENGINEER, and provided OWNER and ENGINEER do not remedy such suspension or failure within that time, terminate the Agreement and recover from OWNER payment on the same terms as provided in paragraph 15.4. In lieu of terminating the Agreement and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within thirty days after it is submitted, or OWNER has failed for thirty days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may upon seven day's written notice to OWNER and ENGINEER stop the Work until payment of all such amount due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.5 are not intended to preclude CONTRACTOR from making claim under Articles 11 and 12 for an increase in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping Work as permitted by this paragraph.

ARTICLE 16--DISPUTE RESOLUTION

If and to the extent that OWNER and CONTRACTOR have agreed on the method and procedure for resolving disputes between them that may arise under this Agreement, such dispute resolution method and procedure, if any, shall be as set forth in Exhibit GC-A, "Dispute Resolution Agreement," to be attached hereto and made a part hereof. If no such agreement on the method and procedure for resolving such disputes has been reached, and subject to the provisions of paragraphs 9.10, 9.11, and 9.12, OWNER and CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

ARTICLE 17--MISCELLANEOUS

Giving Notice:

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

Computation of Times:

17.2.1. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.2.2. A calendar day of twenty-four hours measured from midnight to the next midnight will constitute a day.

Notice of Claim:

17.3. Should OWNER or CONTRACTOR suffer injury or damage to person or property because of any error, omission or act of the other party or of any of the other party's employees or agents or others for whose acts the other party is legally liable, claim will be made in writing to the other party within a reasonable time of the first observance of such injury or damage. The provisions of this paragraph 17.3 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose.

Cumulative Remedies:

17.4. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon CONTRACTOR by paragraphs 6.12, 6.16, 6.30, 6.31, 6.32, 13.1, 13.12, 13.14, 14.3 and 15.2 and all of the rights and remedies available to OWNER and ENGINEER thereunder, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

Professional Fees and Court Costs Included:

17.5. Whenever reference is made to "claims, costs, losses and damages," it shall include in each case, but not be limited to, all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs.

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1. ENUMERATION OF PLANS, SPECIFICATIONS AND ADDENDA

Following are the Plans, Specifications and Addenda which form a part of this contract, as set forth in Paragraph 1 of the General Conditions, "Contract and Contract Documents":

DRAWINGS

General Construction:	Nos.	_____
Heating and Ventilating:	"	_____
Plumbing:	"	_____
Electrical:	"	_____
_____	"	_____
_____	"	_____

SPECIFICATIONS:

General Construction	Page	_____	to	_____,	incl.
	Page	_____	to	_____,	incl.
Heating and Ventilating:	Page	_____	to	_____,	incl.
Plumbing:	Page	_____	to	_____,	incl.
Electrical:	Page	_____	to	_____,	incl.
_____	Page	_____	to	_____,	incl.
_____	Page	_____	to	_____,	incl.

ADDENDA:

No.	_____	Date	_____	No.	_____	Date	_____
No.	_____	Date	_____	No.	_____	Date	_____

2. STATED ALLOWANCES

Pursuant to Article 11.8 of the General Conditions, the Contractor shall include the following cash allowances in his proposal:

(a)	For	_____	(Page	_____	of Specifications)	$ _____
(b)	For	_____	(Page	_____	of Specifications)	$ _____
(c)	For	_____	(Page	_____	of Specifications)	$ _____
(d)	For	_____	(Page	_____	of Specifications)	$ _____
(e)	For	_____	(Page	_____	of Specifications)	$ _____
(f)	For	_____	(Page	_____	of Specifications)	$ _____

3. A. Payments to Contractor

1. To insure the proper performance of this contract, the Owner shall retain five percent (5%) of the amount of each estimate until final completion and acceptance of all work covered by this contract: Provided that the Contractor shall submit his estimate not later than the first day of the month: Provided further that on completion and acceptance of each separate building, public work, or other division of the contract, on which the price is stated separately in the contract, payment may be made in full, including retained percentages thereon, less authorized deductions.

2. In preparing estimates the material delivered on the site and preparatory work done may be taken into consideration.

3. All material and work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made or the restoration of any damaged work, or as a waiver of the right of the Owner to require the fulfillment of all of the terms of the contract.

4. Owner's Right to Withhold Certain Amounts and Make Application Thereof: The Contractor agrees that he will indemnify and save the Owner harmless from all claims growing out of the lawful demands of subcontractors, laborers, workers, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this contract. The Contractor shall, at the Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If the Contractor fails so to do, then the Owner may, after having served written notice on the said Contractor, either pay unpaid bills, of which the Owner has written notice, direct, or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the Contractor shall be resumed, in accordance with the terms of this contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor or his Surety. In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor, and any payment so made by the Owner shall be considered as a payment made under the contract by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payments made in good faith.

B. Payments by Contractor

The Contractor shall pay (a) for all transportation and utility services not later than the 20th day of the calendar month following that in which services are rendered, (b) for all materials, tools, and other expendable equipment to the extent of ninety percent (90%) of the cost thereof, not later than the 20th day of the calendar month following that in which such materials, tools, and equipment are delivered at the site of the project, and the balance of the cost thereof, not later than the 30th day following the completion of that part of the work in or on which such materials, tools, and equipment are incorporated or used, and (c) to each of his subcontractors, not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by his subcontractors to the extent of each subcontractor's interest therein.

C. Time for Completion and Liquidated Damages

It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning and the time for completion as specified in the contract of the work to be done hereunder are ESSENTIAL CONDITIONS of this contract; and it is further mutually understood and agreed that the work embraced in this contract shall be commenced on a date to be specified in the "Notice to Proceed".

The Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the work described herein is a reasonable time for the completion of the same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

If the said Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this contract, to pay to the Owner the amount specified in the contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work.

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

It is further agreed that time is of the essence of each and every portion of this contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this contract. Provided that the Contractor shall not be charged with liquidated damages or any excess cost when the Owner determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner; Provided further that the Contractor shall not to be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

(a) To any preference, priority or allocation order duly issued by the Government.

(b) To unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and severe weather; and

(c) To any delays of Subcontractors or suppliers occasioned by any of the causes specified in subsections (a) and (b) of this article:

Provided further that the Contractor shall, within ten (10) days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the contract, notify the Owner, in writing, of the delay and notify the Contractor within a reasonable time of its decision in the matter.

D. Protection of Lives and Health

"The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site, which occur as a result of his prosecution of the work. The safety provisions of applicable laws and building and construction codes, in addition to specific safety and health regulations described by Chapter XIII, Bureau of Labor Standards, Department of Labor, Part 1518, Safety and Health Regulations for Construction, as outlined in the Federal Register, Volume 36, No. 75, Saturday, April 17, 1971. Title 29 - LABOR, shall be observed and the Contractor shall take or cause to be taken, such additional safety and health measures as the Contracting Authority may determine to be reasonably necessary."

E. Subcontracts

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5 (a)(1) through (10) and such other clauses as the (Department of Housing and Urban Development) may by appropriate instructions require, 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 29 CFR 5.5.

F. Interest of Member of or Delegate to Congress

No member of or Delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this contract or to any benefit that may arise there from, but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

G. Other Prohibited Interests

No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part hereof. No officer, employee, architect, attorney, engineer or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

H. Use and Occupancy Prior to Acceptance by Owner

The Contractor agrees to the use and occupancy of a portion or unit of the project before formal acceptance by the Owner, provided the Owner:

(a) Secures written consent of the Contractor except in the event, in the opinion of the Architect/Engineer, the Contractor is chargeable with unwarranted delay in final clean-up of punch list items or other contract requirements.

(b) Secures endorsement from the insurance carrier and consent of the surety permitting occupancy of the building or use of the project during the remaining period of construction, or,

(c) When the project consists of more than one building, and one of the buildings is occupied, secures permanent fire and extended coverage insurance, including a permit to complete construction. Consent of the surety must also be obtained.

I. Photographs of the Project

If required by the Owner, the Contractor shall furnish photographs of the project, in the quantities and as described in the Supplemental General Conditions.

J. Suspension of Work

Should the Owner be prevented or enjoined from proceeding with work either before or after the start of construction by reason of any litigation or other reason beyond the control of the Owner, the Contractor shall not be entitled to make or assert claim for damage by reason of said delay; but time for completion of the work will be extended to such reasonable time as the Owner may determine will compensate for time lost by such delay with such determination to be set forth in writing.

4. FEDERAL LABOR STANDARDS PROVISIONS

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.

A. 1. (i) Minimum Wages

All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), 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 than 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 Part 5.5(a)(iv). 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 FR Part 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(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 therefore 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; and

(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 and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, 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 under OMB Control Number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representative, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator 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 1215-0140.)

(d) The wage rate (including the fringe benefits where appropriate) determined pursuant to subparagraphs (1)(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 persons, 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 1215-0140.)

2. Withholding

HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices and trainees, 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 or trainee, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, 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 Comptroller General shall make sure disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records.

Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of 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 1215-0140 and 1215-0017.)

(ii)(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 Part 5.5(a)(3)(i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149).

(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 maintained under 29 CFR Part 5.5(a)(3)(i) and that such information is correct and complete;

(2) That each laborer or mechanic (including each 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.

(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 paragraph A.3.(ii)(b) of this section.

(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 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph A.3.(i) of this section available for inspection, copying, or transcription by authorized representative of HUD or its designee or the Department of Labor, and shall permit such representative 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 Part 5.12.

4. (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, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, 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 Bureau of Apprenticeship and Training 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 Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, 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 journeyman under this part 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 29 CFR 5.5(a)(1) through (10) and such other clauses as HUD or its designee may by appropriate instructions require, 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 29 CFR Part 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.

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 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) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1010, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part "Whoever, for the purpose of ...influencing in any way the action of such Administration ...makes, utters or publishes any statement, knowing the same to be false ...shall be fined not more than $5,000 or imprisoned not more than two years, or both."

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

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.

2. Violation; liability for unpaid wages, liquidated damages.

In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefore 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 (1) of this paragraph, in the sum of $10 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 subparagraph (1) of this paragraph.

3. Withholding for unpaid wages and liquidated damages.

   HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any 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 (2) of this paragraph.

4. Subcontracts.

   The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (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 (1) through (4) of this paragraph.

C. Health and Safety

1. No laborer or mechanic shall be required to work in surroundings 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 by regulation.

2. The contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 (formerly part 1518) 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).

3. The Contractor shall include the provisions of this Article in every subcontract so that such provisions will be binding on each subcontractor. The Contractor shall take such action with respect to any subcontract as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

5. SPECIAL HAZARDS

The Contractor's and his Subcontractor's Public Liability and Property Damage Insurance shall provide adequate protection against the following special hazards:

6. CONTRACTOR'S AND SUBCONTRACTOR'S PUBLIC LIABILITY, VEHICLE LIABILITY, AND PROPERTY DAMAGE INSURANCE

As required under Article 5 of the General Conditions, the Contractor's Public Liability Insurance and Vehicle Liability Insurance shall be in an amount not less than $_1,000,000.00__ for injuries, including accidental death, to any one person, and subject to the same limit for each person, in an amount not less than $__1,000,000.00__ on account of one accident, and Contractor's Property Damage Insurance in an amount not less than $__1,000,000.00__.

The Contractor shall either (1) require each of his subcontractors to procure and to maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage Insurance of this type and in the same amounts as specified in the preceding paragraph, or (2) insure the activities of his subcontractors in his own policy.

7. PHOTOGRAPHS OF PROJECT

As provided in Paragraph 3.I of the Supplemental General Conditions, the Contractor will furnish photographs in the number, type, and stage as enumerated below:

8. SCHEDULE OF OCCUPATIONAL CLASSIFICATIONS AND MINIMUM HOURLY WAGE RATES AS REQUIRED UNDER PARAGRAPH 4.B OF THE SUPPLEMENTAL GENERAL CONDITIONS

Given on Pages __ 34 __, __ 35 __ and __ 36 __.

9. BUILDER'S RISK INSURANCE

As provided in the General Conditions, Article 5.6, the Contractor will/~~will not~~** maintain Builder's Risk Insurance (fire and extended coverage) on a 100 percent completed value basis on the insurable portions of the project for the benefit of the Owner, the Contractor, and all Subcontractors, as their interests may appear.

_____

** Strike out one.

10. SPECIAL EQUAL OPPORTUNITY PROVISIONS

A. Activities and Contracts Not Subject to Executive Order 11246, as Amended

(Applicable to Federally assisted construction contracts and related subcontracts $10,000 and under.)

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

1. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor shall take affirmative action to ensure that applicants for employment are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: 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.

2. The Contractor shall post in conspicuous places, available to employees and applicants for employment, notices to be provided by Contracting Officer setting forth the provisions of this nondiscrimination clause. The Contractor shall state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

3. Contractors shall incorporate foregoing requirements in all subcontracts.

B. Executive Order 11246 (contracts/subcontracts above $10,000)

1. Section 202 Equal Opportunity Clause

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

a. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: 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. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

b. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration without regard to race, color, religion, sex, or national origin.

c. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding a notice to be provided by the Contract Compliance Officer advising the said labor union or workers' representatives of the Contractor's commitment under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

d. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

e. The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the Department of the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and others.

f. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

g. The Contractor will include the provisions of the sentence immediately preceding paragraph a. and the provisions of paragraphs a. through g. in every subcontract or purchase order unless exempted by rules, regulations, orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Department may direct as a means of enforcing such provisions, including sanctions for non-compliance. Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Department, the Contractor may request the United States to enter into such litigation to protect the interest of the United States.

2. Notice of Requirement for Affirmative Action to ensure Equal Employment Opportunity (Executive Order 11246). (Applicable to contracts/subcontracts exceeding $10,000.)

a. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

b. 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:

Goals for minority participation	Goals for female participation
Insert Goals	Insert Goals
26.5%	6.9%

NOTE: <u>THESE GOALS MUST BE PROVIDED.</u> Also, list <u>State Geographic Area to be covered on following page</u>.

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 geographic area located outside of the covered area, it shall apply the goals established for such geographic 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 Opportunity 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 established for the geographical area where the contract resulting from this solicitation is to be performed. 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.

c. 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; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

d. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is __Dyer County, Tennessee_____ _____.

3. Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246)

a. As used in these specifications:

(1) "Covered area" means the geographical area described in the solicitation from which this contract resulted;

(2) "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

(3) "Employer identification number" means the federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;

(4) "Minority" includes:

(a) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

(b) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South America or other Spanish Culture or origin, regardless of race);

(c) 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);

(d) 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).

b. 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.

c. 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.

d. The Contractor shall implement the specific affirmative action standards provided in paragraphs g.(1) through (16) 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 contracts 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 geographic area where the contract is being performed. Goals are published periodically in the Federal Register in notice form and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

e. 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.

f. 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.

g. 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:

(1) 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.

(2) 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 union have employment opportunities available, and maintain a record of the organization’s responses.

(3) 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.

(4) 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.

(5) Develop on-the-job training opportunities and/or participate in training programs for the area 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 by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under g.(2) above.

(6) Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation 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's EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

(7) 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 on-site 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.

(8) 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.

(9) 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 of 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.

(10) 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 work force.

(11) Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR part 60-3.

(12) 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.

(13) 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.

(14) 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.

(15) 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.

(16) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

h. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations g.(1) through (16). 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 g.(1) through (16) 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 shall not be a defense for the Contractor's non-compliance.

i. 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 underutilized).

j. 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.

k. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

l. 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 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.

m. 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 g. 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.

n. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company's 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 where 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 location at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractor shall not be required to maintain separate records.

o. 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).

C. Certification of Nonsegregated Facilities (Over $10,000)

By the submission of this bid, the bidder, offeror, applicant or subcontractor certifies that he/she does not maintain or provide for his/her employees any segregated facility at any of his/her establishments, and that he/she does not permit employees to perform their services at any location, under his/her control, where segregated facilities are maintained. He/She certifies further that he/she will not maintain or provide for employees any segregated facilities at any of his/her establishments, and he/she will not permit employees to perform their services at any location under his/her control where segregated facilities are maintained. The bidder, offeror, applicant or subcontractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause of this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms, and other storage or dressing areas, ***transportation and housing facilities provided for employees which are segregated on the basis of race, color, religion, or are in fact segregated on the basis of race, color, religion, or otherwise. He/She further agrees that (except where he/she has obtained identical certifications from proposed subcontractors for specific time periods) he/she will obtain identical certification from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause; that he/she will retain such certifications in his/her files; and that he/she will forward the following notice to such proposed subcontractors (except where proposed subcontractors have submitted identical certifications for specific time periods).

D. Civil Rights Act of 1964

Under Title VI of the Civil Rights Act of 1964, no person shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

E. Section 109 of the Housing and Community Development Act of 1974

No person in the United States shall on the grounds of race, color, national origin, or sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with funds made available under this title.

F. "The Section 3 Clause"

1. The work to be performed under this contract is on a project assisted under a program providing direct Federal financial assistance from the Department of Housing and Urban Development and is subject to the requirements of section 3 of the Housing Urban Development Act of 1968, as amended, 12 U.S.C. 1701u. Section 3 requires that to the greatest extent feasible, opportunities for training and employment be given to lower income residents of the area of the Section 3 covered project, and contracts for work in connection with the project be awarded to business concerns which are located in, or owned in substantial part by persons residing in the area of the Section 3 covered project.

2. The parties to this contract will comply with the provisions of said Section 3 and the regulations issued pursuant thereto by the Secretary of Housing and Urban Development set forth in 24 Part CFR 135, and all applicable rules and orders of the Department issued thereunder prior to the execution of this contract. The parties to this contract certify and agree that they are under no contractual or other disability which would prevent them from complying with these requirements.

3. The contractor will send to each labor organization or representative of workers with which he has a collective bargaining agreement or other contract or understanding, if any, a notice advising the said labor organization or workers' representative of his commitments under this Section 3 clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment or training.

4. The contractor will include this Section 3 clause in every subcontract for work in connection with the project and will, at the direction of the applicant for or recipient of Federal Financial assistance, take appropriate action pursuant to the subcontract upon a finding that the subcontractor is in violation of regulations issued by the Secretary of Housing and Urban Development, 24 CFR Part 135. The contractor will not subcontract with any subcontractor where it has notice or knowledge that the latter has been found in violation of regulations under 24 CFR part 135 and will not let any subcontract unless the subcontractor has first provided it with a preliminary statement of ability to comply with the requirements of these regulations.

5. Compliance with the provisions of Section 3, the regulations set forth in 24 CFR Part 135, and all applicable rules and orders of the Department issued thereunder prior to the execution of the contract, shall be a condition of the Federal financial assistance provided to the project, binding upon the applicant or recipient, its contractors and subcontractors, its successors, and assigns to those sanctions specified by the grant or loan agreement or contract through which Federal assistance is provided, and to such sanctions as are specified by 24 CFR Part 135.

G. Age Discrimination Act of 1975

No person in the United States shall, on the basis of age, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under, any program or activity receiving Federal financial assistance.

H. Section 504 Handicapped

Non-Discrimination for Handicapped Workers

No otherwise qualified handicapped individual in the U.S., as defined in Section 7, Paragraph 6 of the Rehabilitation Act of 1973 shall, solely by reason of this handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

11. CERTIFICATION OF COMPLIANCE WITH AIR AND WATER ACTS

(Applicable to Federally assisted construction contracts and related subcontracts exceeding $100,000)

Compliance with Air and Water Acts

During the performance of this contract the contractor and all subcontractors shall comply with the requirements of the Clean Air Act, as amended, 42 USC 1857 et seq., the Federal Water Pollution Control Act, as amended, 33 USC 1251 et seq., and the regulations of the Environmental Protection Agency with respect thereto, at 40 CFR Part 15, as amended.

In addition to the foregoing requirements, all nonexempt contractors and subcontractors shall furnish to the Owner, the following:

1. A stipulation by the Contractor or subcontractors, that any facility to be utilized in the performance of any nonexempt contract or subcontract, is not listed on the List of Violating Facilities issued by the Environmental Protection Agency (EPA) pursuant to 40 CFR 15.20.

2. Agreement by the Contractor to comply with all the requirements of Section 114 of the Clean Air Act, as amended, (42 USC 1857c-8) and Section 308 of the Federal Water Pollution Control Act, as amended, (33 USC 1318) relating to inspection, monitoring, entry, reports and information, as well as all other requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder.

3. A stipulation that as a condition for the award of the contract, prompt notice will be given of any notification received from the Director, Office of Federal Activities, EPA, indicating that a facility utilized, or to be utilized for the contract, is under consideration to be listed on the EPA List of Violating Facilities.

4. Agreement by the Contractor that he will include, or cause to be included, the criteria and requirements in paragraph (1) through (4) of this section in every nonexempt subcontract and requiring that the Contractor will take such action as the Government may direct as a means of enforcing such provisions.

12. SPECIAL CONDITIONS PERTAINING TO HAZARDS, SAFETY STANDARDS AND ACCIDENT PREVENTION

A. Lead-Based Paint Hazards

(Applicable to contracts for construction or rehabilitation of residential structures.) The construction or rehabilitation of residential structures is subject to the HUD Lead-Based Paint regulations, 24 CFR Part 35. The Contractor and Subcontractors shall comply with the provisions for the elimination of lead-base paint hazards under sub-part B of said regulations. The Owner will be responsible for the inspections and certifications required under Section 35.14(f) thereof.

B. Use of Explosives (Modify as Required)

When the use of explosives is necessary for the prosecution of the work, the Contractor shall observe all local, state and Federal laws in purchasing and handling explosives. The Contractor shall take all necessary precaution to protect completed work, neighboring property, water lines, or other underground structures. Where there is danger to structures or property from blasting, the charges shall be reduced and the material shall be covered with suitable timber, steel or rope mats.

The Contractor shall notify all owners of public utility property of intention to use explosives at least eight hours before blasting is done, close to such property. Any supervision or direction of use of explosives by the engineer, does not in any way reduce the responsibility of the Contractor or his Surety for damages that may be caused by such use.

C. Danger Signals and Safety Devices (Modify as Required)

The Contractor shall make all necessary precautions to guard against damages to property and injury to persons. He shall put up and maintain in good condition, sufficient red or warning lights at night, suitable barricades and other devices necessary to protect the public. In case the Contractor fails or neglects to take such precautions, the Owner may have such lights and barricades installed and charge the cost of this work to the Contractor. Such action by the Owner does not relieve the Contractor of any liability incurred under these specifications or contract.

13. FLOOD DISASTER PROTECTION

This Contract is subject to the requirements of the Flood Disaster Protection Act of 1973 (P.L. 93-234). Nothing included as a part of this Contract is approved for acquisition or construction purposes as defined under Section 3(a) of said Act, for use in an area identified by the Secretary of HUD as having special flood hazards which is located in a community not then in compliance with the requirements for participation in the national flood insurance program pursuant to Section 201(d) of said Act; and the use of any assistance provided under this Contract for such acquisition or construction in such identified areas in communities then participating in the national flood insurance program shall be subject to the mandatory purchase of flood insurance requirements of Section 102(a) of said Act.

Any contract or agreement for the sale, lease, or other transfer of land acquired, cleared or improved with assistance provided under the Contract shall contain, if such land is located in an area identified by the Secretary as having special flood hazards and in which the sale of flood insurance has been made available under the National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 et seq., provisions obligating the transferee and its successors or assigns to obtain and maintain, during the ownership of such land, such flood insurance as required with respect to financial assistance for acquisition or construction purposes under Section 102(a) of the Flood Disaster Protection Act of 1973.

14. ACCESS TO RECORDS/MAINTENANCE OF RECORDS

The Contractor shall maintain accounts and records, including personnel, property, and financial records, adequate to identify and account for all costs pertaining to the contract and such other records as may be deemed necessary by the locality to assure proper accounting for all funds. These records will be available for audit purposes to the locality or the State or any other authorized representative, and will be retained for three years after contract completion unless permission to destroy them is granted by the locality. Moreover, the locality, State, or any authorized representative shall have access to any books, documents, papers, and records of the Contractor which are directly pertinent to this contract for the purpose of making audit, examination, excerpts, and transcriptions.

15. CONFLICT OF INTEREST OF OFFICERS OR EMPLOYEES OF THE LOCAL JURISDICTION, MEMBERS OF THE LOCAL GOVERNING BODY, OR OTHER PUBLIC OFFICIALS

No officer or employee of the local jurisdiction or its designees or agents, no member of the governing body, and no other public official of the locality who exercises any function or responsibility with respect to this contract, during his/her tenure or for one year thereafter, shall have any interest, direct or indirect, in any contract or subcontract, or the proceeds thereof, for work to be performed. Further, the contractor shall cause to be incorporated in all subcontracts the language set forth in this paragraph prohibiting conflict of interest.

16. DRUG-FREE WORKPLACE

Under the provisions of Tennessee Code Annotate § 50-9-113 enacted by the General Assembly effective 2001, a) employers with five (5) or more employees who contract with either the state or a local government to provide construction services are required to submit an affidavit stating that they have a drug free workplace program that complies with Title 50, Chapter 9, in effect at the time of submission of a bid at least to the extent required of governmental entities. The statute, imposes other requirements on the contractor, but the grantee's responsibility is specifically limited in section (b) of the state as follows:

(b) A written affidavit by the principal officer of a covered employer provided to a local government at the time such bid or contract is submitted stating that the employer is in compliance with this section shall absolve the local government of all further responsibility under this section and any liability arising from the employer's compliance or failure of compliance with the provisions of this section.

17. PROJECT SIGN

If a project sign is erected, it must include the following:

Governor *(Name)*
Department of Economic and Community Development
Commissioner *(Name)*
CDBG Grant *(Amount)*

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2.5 DIVISION 05 -- METALS

05 40 00 - Cold-Formed Metal Framing

2.6 DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES

06 10 00 - Rough Carpentry

06 41 00 - Architectural Wood Casework

06 83 16 - Fiberglass Reinforced Paneling

2.7 DIVISION 07 -- THERMAL AND MOISTURE PROTECTION

07 05 53 - Fire and Smoke Assembly Identification

07 21 00 - Thermal Insulation

07 25 00 - Weather Barriers

07 46 46 - Fiber-Cement Siding

07 62 00 - Sheet Metal Flashing and Trim

07 84 00 - Firestopping

07 92 00 - Joint Sealants

2.8 DIVISION 08 -- OPENINGS

08 11 13 - Hollow Metal Doors and Frames

08 12 13 - Hollow Metal Frames

08 14 16 - Flush Wood Doors

08 43 13 - Aluminum-Framed Storefronts

08 71 00 - Door Hardware

08 80 00 - Glazing

08 83 00 - Mirrors

2.9 DIVISION 09 -- FINISHES

09 05 61 - Common Work Results for Flooring Preparation

09 21 16 - Gypsum Board Assemblies

09 22 16 - Non-Structural Metal Framing

09 30 00 - Tiling

09 51 00 - Acoustical Ceilings

09 68 13 - Tile Carpeting

09 91 13 - Exterior Painting

09 91 23 - Interior Painting

2.10 DIVISION 10 -- SPECIALTIES

10 14 00 - Signage

10 21 13.19 - Plastic Toilet Compartments

10 28 00 - Toilet, Bath, and Laundry Accessories

10 73 16.13 - Metal Canopies

2.11 DIVISION 12 -- FURNISHINGS

12 36 00 - Countertops

2.12 DIVISION 13 -- SPECIAL CONSTRUCTION

13 34 19 - Metal Building Systems

2.13 DIVISION 23 -- HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 01 30.51 - HVAC Air-Distribution System Cleaning

23 05 00 - Common Work Results For HVAC

23 05 13 - Common Motor Requirements for HVAC Equipment

23 05 16 - Expansion Fittings and Loops for HVAC Piping

23 05 23 - General-Duty Valves for HVAC Piping

23 09 23 - Direct-Digital Control System for HVAC

. 23 33 19 - Duct Silencers

23 64 23 - Packaged, Air Colled Scroll Chiller

23 73 13 - Modular Indoor Central-Station Air-Handling Units

2.15 DIVISION 28 -- ELECTRONIC SAFETY AND SECURITY

28 23 13 - Clinical Video Observation System

2.16 DIVISION 31 -- EARTHWORK

31 10 00 - Site Clearing

31 22 00 - Grading

31 23 16 - Excavation

31 23 16.13 - Trenching

31 23 23 - Fill

31 31 16 - Termite Control

2.17 DIVISION 32 -- EXTERIOR IMPROVEMENTS

32 11 23 - Aggregate Base Courses

32 12 16 - Asphalt Paving

32 13 13 - Concrete Paving

32 17 13 - Parking Bumpers

32 17 23.13 - Painted Pavement Markings

32 17 26 - Tactile Warning Surfacing

32 92 19 - Seeding

32 92 23 - Sodding

2.18 DIVISION 33 -- UTILITIES

33 05 13 - Manholes and Structures

33 14 16 - Site Water Utility Distribution Piping

33 31 13 - Site Sanitary Sewerage Gravity Piping

END OF SECTION 00 01 10

SECTION 01 10 00 - SUMMARY

PART 1 GENERAL

1.1 PROJECT

A. Project Name: Dyersburg Police Dept. Training Facility CDBG #54309.

B. Owner's Name: City of Dyersburg.

C. Engineer's Name: SSR, Inc.

D. The Project consists of the construction of a +/- 2,900 sq ft. police training facility and accompanying site amenities, as well as the rededicating wetland surrounding the facility.

1.2 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.3 CONTRACTOR USE OF SITE AND PREMISES

A. Provide access to and from site as required by law and by Owner:
   1. Do not obstruct roadways, sidewalks, or other public ways without permit.

1.4 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner.

1.5 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

A. Unless otherwise noted, all provisions of the sections listed below apply to all contracts. Specific items of work listed under individual contract descriptions constitute exceptions.

B. Section 01 22 00 - Unit Prices.

C. Section 01 30 00 - Administrative Requirements.

D. Section 01 40 00 - Quality Requirements.

E. Section 01 50 00 - Temporary Facilities and Controls.

F. Section 01 51 00 - Temporary Utilities.

G. Section 01 52 13 - Field Offices and Sheds.

H. Section 01 55 00 - Vehicular Access and Parking.

I. Section 01 70 00 - Execution and Closeout Requirements.

J. Section 01 78 00 - Closeout Submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 10 00

SECTION 01 22 00 - UNIT PRICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

C. Defect assessment and non-payment for rejected work.

1.2 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.3 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.4 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Assist by providing necessary equipment, workers, and survey personnel as required.

C. Measurement Devices:
   1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
   2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
   3. Metering Devices: Inspected, tested and certified by the applicable state department within the past year.

D. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

E. Measurement by Area: Measured by square dimension using mean length and width or radius.

F. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

G. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

H. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.

1.5 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected Products.

1.6 DEFECT ASSESSMENT

A. Replace Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct one of the following remedies:
   1. The defective Work will be partially repaired to the instructions of the Architect, and the unit price will be adjusted to a new unit price at the discretion of Architect.

C. The authority of Architect to assess the defect and identify payment adjustment is final.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 22 00

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 002113 - Instructions to Bidders: Restrictions on timing of substitution requests.

B. Section 004325 - Substitution Request Form - During Procurement: Required form for substitution requests made prior to award of contract (During procurement).

C. Section 006325 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).

D. Section 013000 - Administrative Requirements: Submittal procedures, coordination.

E. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies and equipment.

1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.

a. Unavailability.

b. Regulatory changes.

2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

a. Substitution requests offering advantages solely to the Contractor will not be considered.

1.04 REFERENCE STANDARDS

A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage) Current Edition.

B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase) Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials and equipment constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.

2. Agrees to provide the same warranty for the substitution as for the specified product.

3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
5. Waives claims for additional costs or time extension that may subsequently become apparent.

B. A Substitution Request for specified installer constitutes a representation that the submitter:
1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
1. Note explicitly any non-compliant characteristics.

D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.

E. Limit each request to a single proposed substitution item.
1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 **SUBSTITUTION PROCEDURES DURING CONSTRUCTION**

A. Submittal Form (after award of contract):
1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
3. Bear the costs engendered by proposed substitution of:
a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

C. Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.

3.03 **RESOLUTION**

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.

1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.04 **ACCEPTANCE**

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.05 **CLOSEOUT ACTIVITIES**

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

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SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document submittal service.

C. Preconstruction meeting.

D. Progress meetings.

E. Construction progress schedule.

F. Progress photographs.

G. Coordination drawings.

H. Submittals for review, information, and project closeout.

I. Number of copies of submittals.

J. Submittal procedures.

1.2 RELATED REQUIREMENTS

A. CDBG Standard Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 01 60 00 - Product Requirements: General product requirements.

1.3 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Conform to requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:
   1. Requests for Information (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

1.4 PROJECT COORDINATOR

A. Project Coordinator: Construction Manager.

B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for construction access, traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Project Coordinator.

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 10 00 - Summary.

F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

G. Make the following types of submittals to Architect through the Project Coordinator:
   1. Requests for Information.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
   2. Contractor and Architect are required to use this service.
   3. It is Contractor's responsibility to submit documents in allowable format.

4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.

C. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.2 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after Notice of Award.

B. Attendance (Not Required):
1. Owner.
2. Architect.
3. Contractor.

C. Agenda:
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contract, Owner and Architect.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.

D. 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.

3.3 PROGRESS MEETINGS

A. Architect will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

B. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Special consultants.
5. Contractor's superintendent.
6. Major subcontractors.

C. Agenda:
   1. Review minutes of previous meetings.
   2. Review of work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Maintenance of progress schedule.
   7. Corrective measures to regain projected schedules.
   8. Planned progress during succeeding work period.
   9. Maintenance of quality and work standards.
   10. Effect of proposed changes on progress schedule and coordination.
   11. Other business relating to work.

D. 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.

3.4 CONSTRUCTION PROGRESS SCHEDULE

A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

C. Within 10 days after joint review, submit complete schedule.

D. Submit updated schedule with each Application for Payment.

3.5 PROGRESS PHOTOGRAPHS

A. Photography Type: Digital; electronic files.

3.6 COORDINATION DRAWINGS

A. Provide information required by Project Coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

3.7 REQUESTS FOR INFORMATION(RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in the Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of the Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.

1. Prepare a separate RFI for each specific item.
    a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
    b. Do not forward requests which solely require internal coordination between subcontractors.
2. Prepare using software provided by the Electronic Document Submittal Service.
3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from the Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
    a. Approval of submittals (use procedures specified elsewhere in this section).
    b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
    c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
    d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, the Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
    a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Owner's, Architect's, and Contractor's names.
3. Discrete and consecutive RFI number, and descriptive subject/title.
4. Issue date, and requested reply date.
5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.
3. Highlight items requiring priority or expedited response.
4. Highlight items for which a timely response has not been received to date.

5. Identify and include improper or frivolous RFIs.

G. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
   1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
   1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
   2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
   3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
   4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.8 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Submit at the same time as the preliminary schedule specified in Section - 01 32 16 - Construction Progress Schedule.
   2. Coordinate with Contractor's construction schedule and schedule of values.
   3. Format schedule to allow tracking of status of submittals throughout duration of construction.
   4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
   5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.9 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Design data.
   3. Shop drawings.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.10 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Certificates.
   2. Test reports.
   3. Inspection reports.
   4. Manufacturer's instructions.
   5. Manufacturer's field reports.
   6. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.11 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in conformance to requirements of Section 01 78 00 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Final Property Survey.

E. Submit for Owner's benefit during and after project completion.

3.12 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

3.13 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a separate transmittal for each item.
   2. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   3. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   4. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.

a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.

5. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
   a. Deliver submittals to Architect at business address.
6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
7. Provide space for Contractor and Architect review stamps.
8. When revised for resubmission, identify all changes made since previous submission.
9. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
10. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
11. Submittals not requested will be recognized, and will be returned "Not Reviewed",

B. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related work.
   2. Do not reproduce the Contract Documents to create shop drawings.
   3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

3.14 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
   1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Architect's and his consultants' actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:
      a. "Approved", or language with same legal meaning.
      b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
         1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
      c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
         1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
   2. Not Authorizing fabrication, delivery, and installation:
      a. "Revise and Resubmit".
         1) Resubmit revised item, with review notations acknowledged and incorporated.
      b. "Rejected".
         1) Submit item complying with requirements of Contract Documents.

E. Architect's and his consultants' actions on items submitted for information:

1. Items for which no action was taken:
   a. "Received" - to notify the Contractor that the submittal has been received for record only.
2. Items for which action was taken:
   a. "Reviewed" - no further action is required from Contractor.

END OF SECTION 01 30 00

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SECTION 01 32 16 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.2 RELATED SECTIONS

A. CDBG Standard Procurement and Contracting Requirements

B. Division 01 - General Requirements

1.3 SUBMITTALS

A. Within 30 days after date established in Notice to Proceed, submit preliminary schedule.

B. If preliminary schedule requires revision after review, submit revised schedule within 5 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

D. Within 5 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

1.4 QUALITY ASSURANCE

A. The person preparing, updating and revising the construction Progress Schedule shall be experienced in the preparation of schedules of similar complexity.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.2 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

END OF SECTION 01 32 16

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SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Control of installation.

F. Defect Assessment.

1.2 DEFINITIONS

A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Conformance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.
   2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

1.4 QUALITY ASSURANCE

A. A city inspector will be on-site throughout the construction process to test and/or oversee testing and quality control.

B. Contractor's Quality Control (CQC) Plan:

1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
   a. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
      1) Management and control of documents and records relating to quality.
      2) Communications.
      3) Coordination procedures.
      4) Resource management.
      5) Process control.
      6) Inspection and testing procedures and scheduling.
      7) Control of noncomplying work.
      8) Tracking deficiencies from identification, through acceptable corrective action, and verification.
      9) Control of testing and measuring equipment.
      10) Project materials certification.
      11) Managerial continuity and flexibility.
   b. Owner will not make a separate payment for providing and maintaining a Quality Control Plan. Include associated costs in Bid price.
   c. Acceptance of the plan is required prior to start of construction activities not including mobilization work. Owner's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. Owner reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.

1.5 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2 TESTING AND INSPECTION

A. Testing Agency Duties:
1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified standards.
3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
5. Perform additional tests and inspections required by Architect.
6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:

a. To provide access to Work to be tested/inspected.
b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
c. To facilitate tests/inspections.
d. To provide storage and curing of test samples.

4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.3 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

END OF SECTION 01 40 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Temporary Controls: Barriers, enclosures, and fencing.

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Field offices.

1.2 RELATED REQUIREMENTS

A. Section 01 51 00 - Temporary Utilities.

B. Section 01 52 13 - Field Offices and Sheds.

C. Section 01 55 00 - Vehicular Access and Parking.

1.3 TEMPORARY UTILITIES - SEE SECTION 01 51 00

A. Provide and pay for all electrical power, lighting, and water required for construction purposes.

B. Existing facilities may not be used.

1.4 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.5 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.6 FENCING

A. Construction: Contractor's option.

1.7 SECURITY - SEE SECTION 01 35 53

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.8 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 55 00

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.9 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.10 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 50 00

SECTION 01 51 00 - TEMPORARY UTILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

1.2 RELATED REQUIREMENTS

A. Section 01 50 00 - Temporary Facilities and Controls:
   1. Temporary telecommunications services for administrative purposes.
   2. Temporary sanitary facilities required by law.

1.3 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

1.4 TEMPORARY ELECTRICITY

A. Cost: By Contractor.

B. Provide power service required from utility source.

C. Provide main service disconnect and over-current protection at convenient location and meter.

D. Permanent convenience receptacles may be utilized during construction.

E. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.5 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

B. Maintain lighting and provide routine repairs.

1.6 TEMPORARY HEATING

A. Cost of Energy: By Contractor.

B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.

C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.7 TEMPORARY COOLING

A. Cost of Energy: By Contractor.

B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.8 TEMPORARY VENTILATION

A. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.9 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Contractor.

B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

C. Connect to existing water source.
   1. Exercise measures to conserve water.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 51 00

SECTION 01 52 13 - FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary field offices for use of Contractor.

B. Maintenance and removal.

1.2 USE OF EXISTING FACILITIES

A. Existing facilities shall not be used for field offices.

PART 2 PRODUCTS

2.1 MATERIALS, EQUIPMENT, FURNISHINGS

A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.2 CONSTRUCTION

A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.

B. Construction: Structurally sound, secure, weather tight enclosures for office. Maintain during progress of Work; remove when no longer needed.

PART 3 EXECUTION

3.1 PREPARATION

A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.2 INSTALLATION

A. Employee Residential Occupancy: Not allowed on Owner's property.

3.3 REMOVAL

A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION 01 52 13

SECTION 01 55 00 - VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Access roads.

B. Parking.

C. Existing pavements and parking areas.

D. Permanent pavements and parking facilities.

E. Construction parking controls.

F. Maintenance.

G. Removal, repair.

H. Mud from site vehicles.

PART 3 EXECUTION

2.1 PREPARATION

A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.

2.2 ACCESS ROADS

A. Use of existing on-site streets and driveways for construction traffic is permitted.

B. Tracked vehicles not allowed on paved areas.

C. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.

D. Provide and maintain access to fire hydrants free of obstructions.

2.3 PARKING

A. Use of existing parking facilities by construction personnel is not permitted.

B. Use of designated areas of new parking facilities by construction personnel is permitted.

C. Arrange for temporary parking areas to accommodate use of construction personnel.

2.4 PERMANENT PAVEMENTS AND PARKING FACILITIES

A. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.

B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

2.5 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.

B. Prevent parking on or adjacent to access roads or in non-designated areas.

2.6 MAINTENANCE

A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

2.7 REMOVAL, REPAIR

A. Repair existing facilities damaged by use, to original condition.

B. Repair damage caused by installation.

2.8 MUD FROM SITE VEHICLES

A. Provide means of removing mud from vehicle wheels before entering streets.

END OF SECTION 01 55 00

SECTION 01 57 13 - TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete for temporary and permanent erosion control structures indicated on drawings.

B. Section 31 10 00 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.

C. Section 31 22 00 - Grading: Temporary and permanent grade changes for erosion control.

D. Section 31 37 00 - Riprap: Temporary and permanent stabilization using riprap.

E. Section 32 11 23 - Aggregate Base Courses: Temporary and permanent roadways.

F. Section 32 92 19 - Seeding: Permanent turf for erosion control.

G. Section 32 92 23 - Sodding: Permanent turf for erosion control.

H. Section 03 30 00 - Cast-in-Place Concrete: Concrete for temporary and permanent erosion control structures indicated on drawings.

1.3 REFERENCE STANDARDS

A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014.

B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2014).

C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2015.

D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.

E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2012.

F. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2016.

G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.

1.4 PERFORMANCE REQUIREMENTS

A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Also comply with all more stringent requirements of State of TN Erosion and Sedimentation Control Manual.

C. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
   1. Obtain and pay for permits and provide security required by authority having jurisdiction.

E. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

F. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

G. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
   1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
   2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

H. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   1. Control movement of sediment and soil from temporary stockpiles of soil.
   2. Prevent development of ruts due to equipment and vehicular traffic.
   3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

I. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
   1. Prevent windblown soil from leaving the project site.
   2. Prevent tracking of mud onto public roads outside site.

3. Prevent mud and sediment from flowing onto sidewalks and pavements.
4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

J. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

K. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

L. Open Water: Prevent standing water that could become stagnant.

M. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Erosion and Sedimentation Control Plan:
1. Submit not less than 30 days prior to anticipated start of clearing, grading, or other work involving disturbance of ground surface cover.
2. Include:
a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
e. Other information required by law.
f. Format required by law is acceptable, provided any additional information specified is also included.
3. Obtain the approval of the Plan by authorities having jurisdiction.
4. Obtain the approval of the Plan by Owner.

C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

E. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

B. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
   1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
   2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D4491.
   3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
   4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
   5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
   6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D4533.
   7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

C. Silt Fence Posts: One of the following, minimum 5 feet long:
   1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.

D. Gravel: See Section 32 11 23 for aggregate.

E. Riprap: See Section 31 37 00.

F. Concrete: See Section 03 30 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.3 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.

1. Width: As required; 20 feet, minimum.
2. Length: 50 feet, minimum.
3. Provide at each construction entrance from public right-of-way.
4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.
1. Provide linear sediment barriers:
   a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
   b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
   c. Along the toe of cut slopes and fill slopes.
   d. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
2. Space sediment barriers with the following maximum slope length upslope from barrier:
   a. Slope of Less Than 2 Percent: 100 feet..
   b. Slope Between 2 and 5 Percent: 75 feet.
   c. Slope Between 5 and 10 Percent: 50 feet.
   d. Slope Between 10 and 20 Percent: 25 feet.
   e. Slope Over 20 Percent: 15 feet.

D. Temporary Seeding: Use where temporary vegetated cover is required.

3.4 INSTALLATION

A. Traffic-Bearing Aggregate Surface:
1. Excavate minimum of 6 inches.
2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.

B. Silt Fences:
1. Store and handle fabric in accordance with ASTM D4873.
2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
5. Install with top of fabric at nominal height and embedment as specified.
6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
7. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.

C. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.

3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.5 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:
1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Clean out temporary sediment control structures weekly and relocate soil on site.

E. Place sediment in appropriate locations on site; do not remove from site.

3.6 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION 01 57 13

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations.

E. Procedures for Owner-supplied products.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Identification of Owner-supplied products.

B. Section 012500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

C. Section 014000 - Quality Requirements: Product quality monitoring.

D. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

E. Section 017419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

F. Section 220513 - Common Motor Requirements for Plumbing Equipment: Motors for plumbing equipment.

G. Section 230513 - Common Motor Requirements for HVAC Equipment: Motors for HVAC equipment.

1.03 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators 2017.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1. Submit within 15 days after date of Agreement.
2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.05 **QUALITY ASSURANCE**

A. Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.

B. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using one of the HPDC (HPD-OLT) online tools.

PART 2 PRODUCTS

2.01 **NEW PRODUCTS**

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. See Section 014000 - Quality Requirements, for additional source quality control requirements.

C. Use of products having any of the following characteristics is not permitted:

1. Made using or containing CFC's or HCFC's.

2. Containing lead, cadmium or asbestos.

D. Where other criteria are met, Contractor shall give preference to products that:

1. If used on interior, have lower emissions, as defined in Section 016116.

2. If wet-applied, have lower VOC content, as defined in Section 016116.

3. Have longer documented life span under normal use.

4. Have a published Health Product Declaration (HPD).

5. Have a published Manufacturer's Inventory of Chemical Content.

2.02 **PRODUCT OPTIONS**

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03 **MAINTENANCE MATERIALS**

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 **SUBSTITUTION LIMITATIONS**

A. See Section 012500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. See Section 011000 - Summary for identification of Owner-supplied products.

B. Owner's Responsibilities:

1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
2. Arrange and pay for product delivery to site.
3. On delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:

1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.

1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts and unit counts.

F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

G. For exterior storage of fabricated products, place on sloped supports above ground.

H. Provide off-site storage and protection when site does not permit on-site storage or protection.

   1. Execute a formal supplemental agreement between Owner and Contractor allowing off-site storage, for each occurrence.

I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

J. Comply with manufacturer's warranty conditions, if any.

K. Do not store products directly on the ground.

L. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

M. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

N. Prevent contact with material that may cause corrosion, discoloration, or staining.

O. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

P. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Surveying for laying out the work.

C. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

D. General requirements for maintenance service.

1.2 QUALIFICATIONS

A. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.3 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

D. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

PART 3 EXECUTION

2.1 EXAMINATION

A. Examine and verify specific conditions described in individual specification sections.

B. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

C. Verify that utility services are available, of the correct characteristics, and in the correct locations.

2.2 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Periodically verify layouts by same means.

H. Maintain a complete and accurate log of control and survey work as it progresses.

2.3 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

2.4 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

2.5 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

D. Clean debris from gutters, area drains, and drainage systems.

E. Clean site; sweep paved areas, rake clean landscaped surfaces.

F. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

2.6 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Owner.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

G. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

2.7 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION 01 70 00

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SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

E. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.2 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Waste Management Plan: Include the following information:
1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

PART 3 EXECUTION

2.1 WASTE MANAGEMENT PROCEDURES

A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Pre-bid meeting.
   2. Pre-construction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 01 74 19

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SECTION 01 78 00 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project Record Documents.

B. Warranties and bonds.

1.2 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Warranties and Bonds:
1. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
2. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
1. Drawings.
2. Addenda.
3. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Record Drawings : Legibly mark each item to record actual construction including:
1. Field changes of dimension and detail.
2. Details not on original Contract drawings.

3.2 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

END OF SECTION 01 78 00

SECTION 02 41 00 - DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

1.2 RELATED REQUIREMENTS

A. Section : Limitations on Contractor's use of site and premises.

B. Section : Description of items to be salvaged or removed for re-use by Contractor.

C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 01 57 13 - Temporary Erosion and Sediment Control.

E. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.

F. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

G. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:
   1. Areas for temporary construction and field offices.

C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 3 EXECUTION

2.1 SCOPE

A. Remove paving and curbs as required to accomplish new work.

B. Remove manholes and manhole covers, curb inlets and catch basins.

C. Remove other items indicated, for salvage, relocation, and recycling.

2.2 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. 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.
3. Provide, erect, and maintain temporary barriers and security devices.
4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
5. Do not close or obstruct roadways or sidewalks without permit.
6. 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.
7. 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. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

2.3 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.

2.4 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 41 00

SECTION 030516
UNDERSLAB VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

1.02 RELATED REQUIREMENTS

A. Section 031000 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 032000 - Concrete Reinforcing.

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

1.03 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs 2017.

1.04 SUBMITTALS

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

B. Product Data: Submit manufacturers' data on manufactured products.

C. Samples: Submit samples of underslab vapor barrier to be used.

D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms (0.6 ng/(s m2 Pa)), maximum.
   2. Thickness: 15 mils (0.4 mm).
   3. Basis of Design:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle (or equal).
      b. Tex Trude; Xtreme Vapor Barrier (15-mil): www.textrude.com.
      c. Or equal.
      d. Substitutions: See Section 016000 - Product Requirements.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches (150 mm).

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 031000
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 032000 - Concrete Reinforcing.

B. Section 033000 - Cast-in-Place Concrete.

C. Section 042001 - Masonry Veneer: Spacing for veneer anchor reglets recessed in concrete.

D. Section 051200 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

E. Section 312316 - Excavation: Shoring and underpinning for excavation.

F. Section 133419 - Metal Building Systems.

1.03 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Structural Concrete 2016.

C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).

D. ACI 347R - Guide to Formwork for Concrete 2014, with Errata (2017).

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.

F. PS 1 - Structural Plywood 2009.

1.04 SUBMITTALS

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

B. Product Data: Provide data on void form materials and installation requirements.

C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

D. Design Data: As required by authorities having jurisdiction.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design formwork under direct supervision of a Professional Structural Engineer experienced in design of concrete formwork and licensed in the State in which the Project is located.

B. Maintain one copy of each installation standard on site throughout the duration of concrete work.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Chamfer outside corners of beams, joists, columns, and walls.

D. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

E. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.

F. Comply with Highways standards of the State of Tennessee.

2.02 **WOOD FORM MATERIALS**

A. Form Materials: At the discretion of the Contractor.

2.03 **REMOVABLE PREFABRICATED FORMS**

A. Manufacturers:
   1. Alabama Metal Industries Corporation: www.amico-online.com/#sle.
   2. S-Form; Aluminum Formwork Systems: www.s-form.us/#sle.
   3. SureVoid Products, Inc: www.surevoid.com/#sle.
   4. Or equal.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Preformed Steel Forms: Minimum 16 gage, 0.0598 inch (1.52 mm) thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

C. Preformed Aluminum Forms: ASTM B221 (ASTM B221M), 6061-T6 alloy, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

D. Preformed Plastic Forms: Thermoplastic polystyrene form liner, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

E. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

2.04 **FORMWORK ACCESSORIES**

A. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
   1. Composition: Colorless reactive, mineral oil-based, soy-based, or vegetable-oil based compound.
   2. Do not use materials containing diesel oil or petroleum-based compounds.
   3. VOC Content: In compliance with applicable local, State, and federal regulations.
   4. Products:
      a. SpecChem, LLC; Bio Strip WB (water-based): www.specchemllc.com/#sle.
      b. W. R. Meadows, Inc; Duogard: www.wrmeadows.com/#sle.
      c. Or equal.
      d. Substitutions: See Section 016000 - Product Requirements.

B. Filler Strips for Chamfered Corners: Rigid plastic type; 1 x 1 inch (25.4 x 25.4 mm) size; maximum possible lengths. Provide PolyComp manufactured by Sylvan Products LLC. (Or equal) .

C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

D. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 051200.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Coordinate this section with other sections of work that require attachment of components to formwork.

3.03 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

3.04 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.05 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.
   1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.06 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

C. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.08 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 031521
TERMITE BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Termite-resistant vapor barrier sheet.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Vapor barrier placement under concrete slab-on-grade.

1.03 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs 2017.

1.04 SUBMITTALS

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

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.

C. Test Reports: Submit manufacturer's summary of independent laboratory and field testing for effectiveness in subterranean termite exclusion.

D. Manufacturer's Installation Instructions.

E. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing this type of work and:
   1. Having minimum of 2 years documented experience.
   2. Approved by manufacturer of treatment materials.
   3. Licensed in the State in which the Project is located.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer's limited warranty.

PART 2 PRODUCTS

2.01 TERMITE BARRIER SHEET

A. Termite-Resistant Vapor Barrier Sheet: Plastic sheet complying with ASTM E1745, Class C; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs, and for exclusion of subterranean termites.

B. Accessory Products: Barrier sheet manufacturer's recommended tape, adhesive, etc., for sealing seams and penetrations in termite barrier.

C. Manufacturer: Stego Technology LLC; Pango Wrap with Pango Tape: www.stegoindustries.com/#sle.

D. Or equal.

E. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen.

B. Verify final grading is complete.

3.02 **INSTALLATION - BARRIER SHEET**

A. Comply with ASTM E1643.

B. Lap joints 6 inches (150 mm), minimum. Seal joints, seams, penetrations, and edges at adjacent materials with manufacturer's recommended products and follow manufacturer's written instructions.

3.03 **PROTECTION**

A. Protect sheet materials from damage after completed installation.

B. Repair damage to installed sheet materials with manufacturer's recommended products and according to the manufacturer's written instructions.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete formwork.

B. Floors and slabs on grade.

C. Concrete reinforcement.

D. Joint devices associated with concrete work.

E. Miscellaneous concrete elements, including equipment pads.

F. Concrete curing.

1.2 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Products and installation for sealants for saw cut joints and isolation joints in slabs.

1.3 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

C. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).

D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).

E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.

F. ACI 306R - Cold Weather Concreting; 2010.

G. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).

H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.

I. ACI 347R - Guide to Formwork for Concrete; 2014.

J. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

K. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

L. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.

M. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.

N. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

O. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.

P. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

Q. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.

R. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.

S. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

T. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

U. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

V. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.

W. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2014.

X. ASTM D8139 - Standard Specification for Semi-Rigid, Closed-Cell Polypropylene Foam, Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction; 2017.

Y. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

Z. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

AA. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996 (Reapproved 2008).

AB. ASTM E1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers (Metric); 1996 (Reapproved 2008).

AC. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.

AD. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

C. Samples: Submit samples of underslab vapor retarder to be used.

D. Test Reports: Submit report for each test or series of tests specified.

1.5 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 306R when concreting during cold weather.

1.6 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
   2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
   3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.2 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.

B. Steel Welded Wire Reinforcement (WWR): Plain type, ASTM A1064/A1064M.
   1. Form: Flat Sheets.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C 33.
   1. Acquire aggregates for entire project from same source.

C. Fly Ash: ASTM C618, Class C or F. If class C, test aggregate for potential ASR reactivity with Petrography ASTM C 295 and Mortar-bar test ASTM C1260..

D. Water: Clean and not potable.

2.4 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

D. Accelerating Admixture: ASTM C494/C494M Type C.

E. Water Reducing Admixture: ASTM C494/C494M Type A.

2.5 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E1745, Class A, 15 mil; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
   1. Installation: Comply with ASTM E1643.
   2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.

2.6 BONDING AND JOINTING PRODUCTS

A. Epoxy Bonding System:
   1. Complying with ASTM C881/C881M and of Type required for specific application.

B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
   1. Material: ASTM D1751, cellulose fiber.
   2. Material: ASTM D1752 sponge rubber (Type I).

C. Plate Dowel System: Steel plate dowel and plastic dowel sleeve; with integral fasteners for attachment to formwork.

2.7 CURING MATERIALS

A. Curing and Sealing Compound, Low Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A, capable of providing adequate bond for flooring adhesives, initially and over the long term.
   1. Vehicle: Water-based.

B. Moisture-Retaining Sheet: ASTM C171.
   1. Polyethylene film, clear, minimum nominal thickness of 0.0040 inch.
   2. White-burlap-polyethylene sheet, weighing not less than 10 ounces per linear yard, 40 inches wide.

C. Water: Potable, not detrimental to concrete.

2.8 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete: foundations
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Water-Cement Ratio: Maximum 45 percent by weight.
   4. Total Air Content: 3 percent, determined in accordance with ASTM C173/C173M.
   5. Maximum Slump: 4 inches.
   6. Maximum Aggregate Size: 1 inch.

E. Normal Weight Concrete: slab on grade
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Cement Content: Minimum 520 pounds per cubic yard.
   4. Total Air Content: 3 percent, determined in accordance with ASTM C173/C173M. Do not let total air content of troweled finished floors to exceed 3%.
   5. Maximum Slump: 4 inches.
   6. Maximum Aggregate Size: 1 inch.

F. Normal Weight Concrete: Exterior Slab on Grade
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
   2. Water-Cement Ratio: Maximum 45 percent by weight.
   3. Total Air Content: 6 percent, determined in accordance with ASTM C173/C173M.
   4. Maximum Slump: 4 inches.

5. Maximum Aggregate Size: 1 inch.

2.9 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.2 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.

E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and inject with epoxy adhesive approved by the entineer of record.

F. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
   1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.3 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.4 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify Architect not less than 24 hours prior to commencement of placement operations.

D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

E. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar.

F. Finish floors level and flat, unless otherwise indicated, within the tolerances specified on structural drawings.

3.5 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.

E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 1/8 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

F. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.6 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values shall be as indicated on structural documents.

B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.

C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.7 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
   2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   3. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; use steel-reinforced plastic trowel blades instead of steel blades to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to receive liquid hardeners, surfaces to receive dry-shake hardeners, surfaces to be polished, and all other exposed slab surfaces.

3.8 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.

C. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
   2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
      a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.
      b. Spraying: Spray water over floor slab areas and maintain wet.
      c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
   3. Final Curing: Begin after initial curing but before surface is dry.

a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.
b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.9 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.11 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION 03 30 00

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SECTION 033511
CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface treatments for concrete floors and slabs.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

B. Section 033000 - Cast-in-Place Concrete: Curing compounds that also function as sealers.

C. Section 099600 - High-Performance Coatings.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with concrete floor placement and concrete floor curing.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.05 MOCK-UP

A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.

B. Mock-Up Size: 10 feet (3 m) square.

C. Locate where directed.

D. Mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.07 FIELD CONDITIONS

A. Maintain light level equivalent to a minimum 200 W light source at 8 feet (2.5 m) above the floor surface over each 20 foot (6 m) square area of floor being finished.

B. Do not finish floors until interior heating system is operational.

C. Maintain ambient temperature of 50 degrees F (10 degrees C) minimum.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

A. Liquid Densifier/Hardener:
   1. Use at following locations: Portions of concrete slab identified as Sealed Concrete (SC) within Finish Plan (A12.0).

2.02 SURFACE TREATMENTS

A. Troweling Aid, Densifier and Curing Agent: Liquid reactive colloidal silica-based topical treatment, spray-applied to wet concrete and floated or troweled into the surface.
   1. Product:
      a. Euclid Chemical Company; Ultrasil DC9 Water Base Densifier and Cure for Concrete
      b. Portions of concrete slab identified as Sealed Concrete (SC) within the Finish Plan (A12.0).
      c. Or equal..
      d. Substitutions: See Section 016000 - Product Requirements.

2.03 **DENSIFIERS AND HARDENERS**

A. Liquid Densifier/Hardener: Penetrating chemical compound that reacts with concrete, filling the pores and dustproofing; for application to concrete after set.
   1. Composition: Lithium silicate.
   2. Products:
      a. Euclid Chemical Company; EUCO DIAMOND HARD: www.euclidchemical.com/#sle.
      b. Or equal..
      c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 **GENERAL**

A. Apply materials in accordance with manufacturer's instructions.

3.03 **COATING APPLICATION**

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.

C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

D. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

END OF SECTION

SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing.

B. Exterior wall sheathing.

C. Formed steel joist and purlin framing and bridging.

D. Water-resistive barrier over sheathing.

1.02 RELATED REQUIREMENTS

A. Section 042001 - Masonry Veneer: Veneer masonry supported by wall stud metal framing.

B. Section 072100 - Thermal Insulation: Insulation within framing members.

C. Section 076200 - Sheet Metal Flashing and Trim: Head and sill flashings.

D. Section 079200 - Joint Sealants.

E. Section 092116 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.

F. Section 092116 - Gypsum Board Assemblies: Gypsum-based sheathing.

G. Section 092216 - Non-Structural Metal Framing.

H. Section 095100 - Acoustical Ceilings: Ceiling suspension system.

I. Section 313116 - Termite Control: Field-applied termiticide and mildewcide for metal framing.

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute 2012.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.

D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable 2018.

E. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members 2018.

F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories 2020.

G. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2013.

H. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.

I. PS 1 - Structural Plywood 2009.

J. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.05 SUBMITTALS

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

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations and designed strength of framing members.

C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
   1. Indicate stud and ceiling joist layout.
   2. Describe method for securing studs to tracks and for bolted framing connections.
   3. Design data:
      a. Shop drawings signed and sealed by a professional structural engineer.
   4. Calculations for loadings and stresses of typical framing members, signed and sealed by a professional structural engineer.

E. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention .

1.06 **QUALITY ASSURANCE**

A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Tennessee.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.07 **MOCK-UP**

A. Provide mock-up of exterior framed wall, including components specified elsewhere, such as insulation, sheathing, window frame, door frame, exterior wall finish, interior wall finish, and flashings.

B. Mock-Up Size: 4 feet by 4 feet, including transition from brick veneer to metal wall panels.

C. Location: On site outside of immediate work area.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Metal Framing:
   1. ClarkDietrich Building Systems: www.clarkdietrich.com/#sle.
   2. Marino: www.marinoware.com/#sle.
   3. SCAFCO Corporation: www.scafco.com/#sle.
   4. Steel Construction Systems: www.steelconsystems.com/#sle.
   5. Or equal.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Framing Connectors and Accessories:
   1. Same manufacturer as metal framing.
   2. Simpson Strong Tie: www.strongtie.com/#sle.
   3. Or equal..
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 **FRAMING SYSTEM**

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100-12.

2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
3. Design Loads: In accordance with applicable codes and as follows: .
   a. Seismic Performance: Design cold-formed metal framing to comply with the following design parameters for seismic to withstand the effects of earthquake motions determined according to ASCE/SEI 7-10. The following indicated values are based on the site specific location of this project:
      1. Site Classification: D.
      2. Risk Category: IV
      3. Importance Factor: 1.2
      4. Mapped Spectral Design Acceleration:
         a. Sds = 1.590
         b. Sd1 = 0.884
      5. Seismic Design Catergory: F
4. Deflection Limits: Design framing systems to withstand design loads without deflection greater that the following:
   a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
5. 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.
6. Wind Loads: Attach cold form metal framing to resist both positive and negative wind pressures indicated on Structural Drawings.
7. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
8. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
   a. Upward and downward movement of 1/2 inch.

C. Shop fabricate framing system to the greatest extent possible.

D. Deliver to site in largest practical sections.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
   1. Gage and Depth: As required to meet structural performance according to manufacturer's engineering.
   2. Galvanized in accordance with ASTM A653/A653M, G90/Z275 coating.
   3. Provide components fabricated from ASTM A1008/A1008M Designation SS (structural steel).
   4. Products:
      a. CEMCO; ProX Header: www.cemcosteel.com/#sle.
      b. ClarkDietrich Building Systems; www.clarkdietrich.com/#sle.
      c. Or equal.
      d. Substitutions: See Section 016000 - Product Requirements.

B. Joists and Purlins: Fabricated from ASTM A653/A653M steel sheet, with G90/Z275 hot dipped galvanized coating.
   1. Base Metal: Structural Steel (SS), Grade 33/230.
   2. Gage and Depth: As required to meet structural performance according to manufacturer's engineering.

C. Framing Connectors: Factory-made, formed steel sheet.
   1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gage, 0.1345 inch (3.42 mm), and factory punched holes and slots.
   2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
   3. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections according to manufacturer's engineering and shop drawings. .
      a. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch (13 mm).
      b. Provide top track with long leg track and head of wall movement connectors; minimum track length of 10 feet (3048 mm).
   4. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.
   5. Wall Stud Bridging Connections: Provide mechanical load-transferring devices that accommodate wind load torsion and weak axis buckling induced by axial compression loads. Provide bridging connections according to manufacturer's engineering and shop drawings.
   6. Products:
      a. ClarkDietrich Building Systems; Spazzer 5400 Bridging Bar: www.clarkdietrich.com/#sle.
      b. ClarkDietrich Building Systems; Drift FastClip: www.clarkdietrich.com/#sle.
      c. ClarkDietrich Building Systems; FastBridge Clip: www.clarkdietrich.com/#sle.
      d. ClarkDietrich Building Systems; FCSC FastClip 5.5": www.clarkdietrich.com/#sle.
      e. Or equal.
      f. Substitutions: See Section 016000 - Product Requirements.

2.04 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
   1. Products:
      a. ITW Commercial Construction North America; ITW CCNA-Buildex Teks Select Series: www.ITWBuildex.com/#sle.
      b. Or equal.
      c. Substitutions: See Section 016000 - Product Requirements.

B. Anchorage Devices: Powder actuated.

C. Welding: Comply with AWS D1.1/D1.1M.

2.05 WALL SHEATHING

A. Plywood; PS 1, Grade C-C, Exterior Exposure.

2.06 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

B. Fabricate steel-framing accessories from steel sheet, ASTM A1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

   Steel Shapes and Clips: ASTM A36/A 36M, zinc coated by hot-dip process per ASTM A123/A 123M.

   Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel headless bolts, with encased end

threaded, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process per ASTM A153/A 153M, Class 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 E488 conducted by a qualified independent testing agency.

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 E1190 conducted by a qualified independent testing agency.

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.

C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

E. Water-Resistive Barrier: As specified in Section 072500.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches (600 mm) on center. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at 16 inches (400 mm) on center; not more than 2 inches (50 mm) from abutting walls and at each side of openings. Connect studs to tracks using clip and tie method.

D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

E. Install load bearing studs full length in one piece. Splicing of studs is not permitted.

F. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

G. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

H. Install intermediate studs above and below openings to align with wall stud spacing.

I. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

J. Attach cross studs or blocking to studs for attachment of fixtures anchored to walls.

K. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

L. Touch-up field welds and damaged galvanized surfaces with primer.

3.03 INSTALLATION OF JOISTS AND PURLINS

A. Install framing components in accordance with manufacturer's instructions.

B. Make provisions for erection stresses. Provide temporary alignment and bracing.

C. Place joists at 16 inches (400 mm) on center; not more than 2 inches (50 mm) from abutting walls, and connect joists to supports using fastener method.

D. Set floor and ceiling joists parallel and level, with lateral bracing and bridging.

E. Locate joist end bearing directly over load bearing studs or provide load distributing member to top of stud track.

F. Provide web stiffeners at reaction points.

G. Touch-up field welds and damaged galvanized surfaces with primer.

3.04 **INSTALLATION OF WALL SHEATHING**

A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
   1. Provide steel diagonal bracing at corners with foam insulation or gypsum board wall sheathing.
   2. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

3.05 **TOLERANCES**

A. Maximum Variation from True Position: 1/4 inch (6.35 mm).

B. Maximum Variation of any Member from Plane: 1/8 inch (3.18 mm).

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheathing.
B. Preservative treated wood materials.
C. Fire retardant treated wood materials.
D. Miscellaneous framing and sheathing.
E. Communications and electrical room mounting boards.
F. Concealed wood blocking, nailers, and supports.
G. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Setting anchors in concrete.
B. Section 055000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
C. Section 061500 - Wood Decking.
D. Section 072500 - Weather Barriers: Water-resistive barrier over sheathing.
E. Section 076200 - Sheet Metal Flashing and Trim: Sill flashings.
F. Section 092116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2017.
C. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.
D. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing 2010 (Reapproved 2017).
E. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2016.
F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
H. AWPA U1 - Use Category System: User Specification for Treated Wood 2018.
I. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
J. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems 2014, with Editorial Revision (2017).
K. PS 1 - Structural Plywood 2009.
L. PS 2 - Performance Standard for Wood-Based Structural-Use Panels 2010.
M. PS 20 - American Softwood Lumber Standard 2020.
N. SPIB (GR) - Grading Rules 2014.

1.04 SUBMITTALS

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

B. Product Data: Provide technical data on wood preservative materials, application instructions, and wood sheathing.

C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.05 **DELIVERY, STORAGE, AND HANDLING**

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

1.06 **WARRANTY**

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 **GENERAL REQUIREMENTS**

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Southern Yellow Pine, unless otherwise indicated.
   2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted.

2.02 **DIMENSION LUMBER FOR CONCEALED APPLICATIONS**

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

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 **CONSTRUCTION PANELS**

A. Wall Sheathing: Oriented strand board wood structural panel; PS 2.
   1. Grade: Structural 1 Sheathing.
   2. Bond Classification: Exposure 1.
   3. Performance Category: 5/8 PERF CAT.
   4. Span Rating: 40/20.
   5. Edges: Square.
   6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
   7. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches (406 mm) and 24 inches (610 mm) on center, respectively.
   8. Warranty: Manufacturer's standard 50 year limited warranty against manufacturing defects and that panels will not delaminate or require sanding due to moisture absorption damage from exposure to weather for up to the stated period.
   9. Manufacturers:
      a. Huber Engineered Woods, LLC; AdvanTech Sheathing: www.huberwood.com/#sle.

b. Or equal..
c. Substitutions: See Section 016000 - Product Requirements.

B. Wall Sheathing: Oriented strand board wood structural panel; PS 2, with factory-applied fire-retardant treatment and fire-resistant cementitious facer.
1. Grade: Structural 1 Sheathing.
2. Bond Classification: Exposure 1.
3. Performance Category: 5/8 PERF CAT.
4. Span Rating: 32/16.
5. Edges: Square.
6. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches (406 mm) and 24 inches (610 mm) on center, respectively.
7. Manufacturers:
a. Louisiana-Pacific Corporation; FlameBlock: www.lpcorp.com/#sle.
b. Or equal..
c. Substitutions: See Section 016000 - Product Requirements.

C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

D. Other Applications:
1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
3. Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.

C. Termite-Resistant Sill Plate Barrier: Self-adhesive, film-backed barrier with release sheet; adheres to concrete substrates and blocks termite access.
1. Thickness: 68 mils (0.068 inch) (1.7 mm).
2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
3. Water Vapor Permeance: 0.035 perm (2 ng/(Pa s sq m)), maximum, when tested in accordance with ASTM E96/E96M.
4. Manufacturers:
a. Polyguard Barrier Systems, Inc, a division of Polyguard Products, Inc; TERM Sill Plate Barrier: www.polyguardbarriers.com/#sle.
b. Or equal.
c. Substitutions: See Section 016000 - Product Requirements.

D. Sill Flashing: As specified in Section 076200.

E. Construction Adhesives:
1. Manufacturers:
a. Franklin International, Inc; Titebond Fast Set Polyurethane Construction Adhesive: www.titebond.com/#sle.
b. Or equal.
c. Substitutions: See Section 016000 - Product Requirements.

F. Water-Resistive Barrier: As specified in Section 072500.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
   1. Manufacturers:
      a. Lonza Group; Dricon: www.wolmanizedwood.com/#sle.
      b. Hoover Treated Wood Products, Inc; Pyro-Guard: www.frtw.com/#sle.
      c. Or equal.
      d. Substitutions: See Section 016000 - Product Requirements.
   2. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Do not use treated wood in direct contact with the ground.
   3. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat rough carpentry items .
      c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
   1. Manufacturers:
      a. Lonza Group; Wolman AG: www.wolmanizedwood.com/#sle.
      b. Viance, LLC; Preserve ACQ: www.treatedwood.com/#sle.
      c. Or equal.
      d. Substitutions: See Section 016000 - Product Requirements.
   2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber exposed to weather.
      c. Treat lumber in contact with roofing, flashing, or waterproofing.
      d. Treat lumber in contact with masonry or concrete.
      e. Treat lumber less than 18 inches (450 mm) above grade.
   3. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
      a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
      b. Treat plywood in contact with roofing, flashing, or waterproofing.
      c. Treat plywood in contact with masonry or concrete.
      d. Treat plywood less than 18 inches (450 mm) above grade.
   4. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.

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

PART 3 EXECUTION

3.01 **PREPARATION**

A. Coordinate installation of rough carpentry members specified in other sections.

3.02 **INSTALLATION - GENERAL**

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 **BLOCKING, NAILERS, AND SUPPORTS**

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.
   10. Or noted within drawings.

3.04 **INSTALLATION OF CONSTRUCTION PANELS**

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.
   1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.

3. Install adjacent boards without gaps.
4. Size: 48 by 96 inches (2440 by 4880 mm), installed horizontally at ceiling height.

3.05 **TOLERANCES**

A. Framing Members: 1/4 inch (6 mm) from true position, maximum.

B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.06 **CLEANING**

A. Waste Disposal: Comply with the requirements of Section 017419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 064100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Hardware.

C. Factory finishing.

D. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

C. Section 123600 - Countertops.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards 2014, with Errata (2018).

B. AWI (QCP) - Quality Certification Program Current Edition.

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1 2017, with Errata (2019).

D. GSA CID A-A-1936 - Adhesive, Contact, Neoprene Rubber 1996a (Validated 2013).

E. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches (300 mm) square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.07 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets: Custom grade.

C. Cabinets at all locations:

1. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
2. Door and Drawer Front Retention Profiles: Fixed panel.
3. Casework Construction Type: Type A - Frameless.
4. Adjustable Shelf Loading: 50 lbs. per sq. ft.
   a. Deflection: L/144.
5. Cabinet Style: Flush overlay.
6. Cabinet Doors and Drawer Fronts: Flush style.
7. Drawer Side Construction: As indicated on drawings.
8. Drawer Construction Technique: Lock shoulder joints.

2.02 **WOOD-BASED COMPONENTS**

A. Wood fabricated from old growth timber is not permitted.

B. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

2.03 **LAMINATE MATERIALS**

A. Manufacturers:
   1. Formica Corporation: www.formica.com/#sle.
   2. Wilsonart LLC: www.wilsonart.com/#sle.
   3. Or equal.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Thermally Fused Laminate (TFL): Melamine resin, NEMA LD 3, Type VGL laminate panels.
   1. Manufacturers:
      a. Wilsonart LLC; TFL Panels: www.wilsonart.com/#sle.
      b. Timber Products Company; Melamine: www.timberproducts.com/products/decorative-overlays/melamine
      c. Or equal..
      d. Substitutions: See Section 016000 - Product Requirements.

C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

D. Provide specific types as indicated on drawings

2.04 **COUNTERTOPS**

A. Countertops are specified in Section 123600.

2.05 **ACCESSORIES**

A. Adhesive: Type recommended by fabricator to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

D. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.06 **HARDWARE**

A. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch (25 mm) spacing adjustments.

B. Drawer and Door Pulls: as specified within the millwork drawings.

C. Catches: Magnetic.
   1. Product: Epco Heavy Duty Magnetic Cabinet Latch (or equal) manufactured by Epco.

D. Drawer Slides:

1. Type: Full extension.
2. Static Load Capacity: Heavy Duty grade.
3. Mounting: Side mounted.
4. Stops: Integral type.
5. Manufacturers:
   a. Accuride International, Inc; Heavy-Duty Drawer Slides: www.accuride.com/#sle.
   b. Knape & Vogt Manufacturing Company; Heavy-Duty Drawer Slides: www.knapeandvogt.com/#sle.
   c. Or as specified within the millwork drawings.
   d. Or equal
   e. Substitutions: See Section 016000 - Product Requirements.

E. Hinges: European style concealed self-closing type, steel with polished finish.
1. Manufacturers:
   a. Blum, Inc; CLIP Top: www.blum.com/#sle.
   b. Or as specified within the drawings.
   c. Or equal.
   d. Substitutions: See Section 016000 - Product Requirements.

2.07 **FABRICATION**

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.
1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches (400 mm) on center.

F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 **INSTALLATION**

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Use fixture attachments in concealed locations for wall mounted components.

D. Use concealed joint fasteners to align and secure adjoining cabinet units.

E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.

F. Secure cabinets to floor using appropriate angles and anchorages.

3.03 **ADJUSTING**

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 **CLEANING**

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

END OF SECTION

SECTION 068316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 097800 - Interior Wall Paneling: Decorative FRP wall paneling.

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics 2010 (Reapproved 2018).

B. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor 2013a.

C. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2016.

D. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels 2017.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

F. FM 4880 - Approval Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials 2015.

G. ISO 846 - Plastics -- Evaluation of the action of microorganisms 1997.

H. ISO 2812-1 - Paints and varnishes -- Determination of resistance to liquids -- Part 1: Immersion in liquids other than water 2017.

1.04 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two samples 6 by 6 inch (152.5 x 152.4 mm) in size illustrating material and surface design of panels.

1.05 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. Crane Composites, Inc; Sequentia Flat: www.cranecomposites.com/#sle.
   2. Marlite, Inc; Standard FRP: www.marlite.com/#sle.
   3. Nudo Products, Inc; FiberScore FRP: www.nudo.com/#sle.
   4. Panolam Industries International, Inc; Panolam FRP: www.panolam.com/#sle.
   5. Or equal
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels:

1. Panel Size: 4 by 8 feet (1.2 by 2.4 m).
2. Panel Thickness: 0.10 inch (2.5 mm).
3. Surface Design: Embossed.
4. Color: As selected by Architect.
5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.03 **MATERIALS**

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
   2. Class 1 fire rated when tested in accordance with FM 4880.
   3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   4. Scratch Resistance: Barcol hardness score greater than 35, when tested in accordance with ASTM D2583.
   5. Impact Strength: Greater than 6 ft lb force per inch (320 J per m), when tested in accordance with ASTM D256.
   6. Sanitation and Cleanability: Comply with 9 CFR 416.2.
   7. Chemical Cleanability: Excellent chemical resistance to common cleaners and detergents when tested in accordance with ISO 2812-1.
   8. Biological Resistance: Rating of 0, when tested in accordance with ISO 846.

B. Trim: Vinyl; color coordinating with panel.

C. Adhesive: Type recommended by panel manufacturer.

D. Sealant: Silicone; color matching panel.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 **INSTALLATION - WALLS**

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Place trim on panel before fastening edges, as required.

G. Fill channels in trim with sealant before attaching to panel.

H. Install trim with adhesive and screws or nails, as required.

I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 070553
FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 FIELD CONDITIONS

A. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Partition Identification Labels:
   1. Fire Wall Signs, Inc; 1 Hr Fire/Smoke Barrier: www.firewallsigns.com/#sle.
   2. Safety Supply Warehouse, Inc; Fire and Emergency Safety Signs: www.safetysupplywarehouse.com/#sle.
   3. Or equal.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).

B. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl or paper sign with factory applied adhesive backing.

C. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil. See Section 099123 for products.

D. Languages: Provide sign markings in English.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 PREPARATION

A. See Section 099123 for substrate preparation for painted markings.

3.03 INSTALLATION

A. Locate markings as required by ICC (IBC).

B. Install adhered markings in accordance with manufacturer's instructions.

C. Install applied markings in accordance with Section 099123.

D. Install neatly, with horizontal edges level.

E. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

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SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 060573 - Wood Treatment: Field-applied termiticide for wood.

C. Section 061000 - Rough Carpentry: Supporting construction for batt insulation.

D. Section 072500 - Weather Barriers: Separate air barrier and vapor retarder materials.

E. Section 078400 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

F. Section 092116 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.03 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.

B. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation 2017, with Editorial Revision (2018).

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013.

D. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing 2003 (Reapproved 2017).

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

G. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C 2016a.

H. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies 2018.

1.04 SUBMITTALS

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

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermal Insulation:
   1. Owens Corning Corporation.

2. Johns Manville.
3. CertainTeed Saint-Gobain.
4. Dow Chemical Company.
5. Kinspan Insulation LLC.
6. Or equal.
7. Substitutions: See Section 016000 - Product Requirements.

2.02 **APPLICATIONS**

A. Insulation Over Pre-Engineered Metal Building (PEMB) Steel Girt Framed walls and Steel Purlin Framed roofs, Vinyl-backed insuation per local code.

B. Insulation in Metal Framed Walls: Batt insulation with vapor retarder.

2.03 **BATT INSULATION MATERIALS**

A. Insulation Over Pre-Engineered Metal Building (PEMB) Steel Girt Framed walls and Steel Purlin Framed roofs: See Section 133419 - Metal Building Systems.

B. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.

C. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
4. Formaldehyde Content: Zero.
5. Thermal Resistance: R-value (RSI-value) of 19 (min.).
6. Thickness: 5-1/2 inch (139.7 mm).
7. Facing: Unfaced.
8. Manufacturers:
a. CertainTeed Corporation; CERTAPRO Commercial Acoustatherm Batts: www.certainteed.com/#sle.
b. Johns Manville; ComfortTherm: www.jm.com/#sle.
c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
d. Or equal.
e. Substitutions: See Section 016000 - Product Requirements.

D. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
3. Thermal Resistance: R-value of 19.
4. Thickness: 5-1/2 inch.
5. Manufacturers:
a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
b. Knauf Insulation; EcoBatt Insulation: www.knaufinsulation.com/#sle.
c. ROCKWOOL (ROXUL, Inc); COMFORTBATT: www.rockwool.com/#sle.
d. Thermafiber, Inc; SAFB: www.thermafiber.com/#sle.
e. Or equal.
f. Substitutions: See Section 016000 - Product Requirements.

2.04 **ACCESSORIES**

A. Sheet Vapor Retarder: Specified in Section 072500.

B. Insulation Fasteners: Appropriate for purpose intended.

C. Adhesive: Gun grade, interior and exterior, and compatible with insulation and substrates; complies with ASTM C557.
   1. Application Temperature: 40 to 100 degrees F (5 to 38 degrees C) at contact surfaces.
   2. Volatile Organic Content (VOC): Less than 7 percent by weight.
   3. Manufacturers:
      a. Liquid Nails, a brand of PPG Architectural Coatings; LN-903 Heavy Duty Construction Adhesive, 10 fl oz: www.liquidnails.com/#sle.
      b. Or equal.
      c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of irregularities.

3.02 **BATT INSTALLATION**

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Staple or nail facing flanges in place at maximum 6 inches (150 mm) on center.

F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

G. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.

H. Tape seal tears or cuts in vapor retarder.

I. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

J. Coordinate work of this section with requirements for vapor retarder specified in Section 072500.

K. Coordinate work of this section with construction of air barrier seal specified in Section 072500.

3.03 **PROTECTION**

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

END OF SECTION

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SECTION 072500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.

1.02 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing: Water-resistive barrier under exterior cladding.

B. Section 061000 - Rough Carpentry: Water-resistive barrier under exterior cladding.

C. Section 072100 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.

D. Section 076200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

E. Section 079200 - Joint Sealants: Sealing building expansion joints.

F. Section 092116 - Gypsum Board Assemblies: Water-resistive barrier under exterior cladding.

1.03 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.

1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

1.04 REFERENCE STANDARDS

A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test 2018.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2017.

C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection 2019.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.

F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials 2013.

G. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers 2016.

H. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems 2014, with Editorial Revision (2017).

1.05 SUBMITTALS

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

B. Product Data: Provide data on material characteristics.

C. Shop Drawings: Provide drawings of special joint conditions and air and water-resistive barrier details at wall openings.

1.06 MOCK-UP

A. Install weather barrier materials in mock-up specified in Section 042001 Masonry Veneer. Mock-up shall include at least one opening within the exterior wall. Mock-up may be retained as part of air barrier and water-resistive barrier installation for building .

1.07 **FIELD CONDITIONS**

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

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

A. Air Barrier Sheet, Mechanically Fastened:
   1. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 5 perms (286 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant procedure).
   3. Water Penetration Resistance: Withstand a water head of 21 inches (55 cm), minimum, for minimum of 5 hours, when tested in accordance with AATCC Test Method 127.
   4. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.
   5. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
   6. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches (50 mm) wide, compatible with sheet material; unless otherwise specified.
   7. Manufacturers:
      a. DuPont Building Innovations; Tyvek Commercial Wrap with FlexWrap NF, StraightFlash, StraightFlash VF, Tyvek Wrap Caps, and Tyvek Tape: www.dupont.com/#sle.
      b. Or equal.
      c. Substitutions: See Section 016000 - Product Requirements.

2.02 **ACCESSORIES**

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
   1. Manufacturers:
      a. DuPont Building Innovations; FlexWrap NF: www.dupont.com/#sle.
      b. DuPont Building Innovations; StraightFlash: www.dupont.com/#sle.
      c. DuPont Building Innovations; StraightFlash VF: www.dupont.com/#sle.
      d. Or equal.
      e. Substitutions: See Section 016000 - Product Requirements.

C. Termite-Resistant Barrier Foundation Flashing: Peel and stick flashing membrane; polyethylene film bonded to sealant.
   1. Thickness: 40 mil, 0.040 inch (1.016 mm) overall.
   2. Roll Width: 12 inch (305 mm).
   3. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
   4. Manufacturers:
      a. Polyguard Barrier Systems, Inc, a division of Polyguard Products, Inc; TERM Flashing Barrier: www.polyguardbarriers.com/#sle.
      b. Or equal.
      c. Substitutions: See Section 016000 - Product Requirements.

D. Pre-formed Transition Membrane: Semi-rigid silicone or polyester composition, tapered edges, tear resistant.

1. Manufacturers:
   a. Dow Chemical Company; DOWSIL Silicone Transition Strip and System: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   b. Fortifiber Building Systems Group; Moistop Corner Shield: www.fortifiber.com/#sle.
   c. Tremco Commercial Sealants & Waterproofing; ProGlaze ETA System 1: www.tremcosealants.com/#sle.
   d. Or equal.
   e. Substitutions: See Section 016000 - Product Requirements.

E. Stainless Steel Flashing: Flexible flashing with 8 mil, 0.008 inch (0.203 mm) thick sheet of Type 304 stainless steel, 8 mil, 0.008 inch (0.203 mm) of butyl adhesive and a siliconized release liner.
   1. Roll Length: 50 feet (15.2 m) long.
   2. Width: 6 inch (152 mm) wide.
   3. Overlap joints at least 2 inch (51 mm).
   4. Manufacturers:
      a. Momentive Performance Materials, Inc/GE Construction Sealants; GE Elemax SS Flashing: www.siliconeforbuilding.com/#sle.
      b. Or equal.
      c. Substitutions: See Section 016000 - Product Requirements.

F. Termite-Resistant Barrier Seam and Window Flashing: Peel and stick flashing membrane; polyethylene film bonded to sealant.
   1. Thickness: 40 mil, 0.040 inch (1.016 mm) overall.
   2. Roll Width: 4 inch (102 mm).
   3. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
   4. Manufacturers:
      a. Polyguard Barrier Systems, Inc, a division of Polyguard Products, Inc; TERM Seam and Window Barrier: www.polyguardbarriers.com/#sle.
      b. Or equal.
      c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION

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

B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.

D. Mechanically Fastened Sheets - On Exterior:
   1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
   2. Overlap seams as recommended by manufacturer but at least 6 inches.
   3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches (305 mm).

4. Attach to framed construction with fasteners extending through sheathing into framing. Space fasteners at 12 to 18 inches (305 to 460 mm) on center along each framing member supporting sheathing.
5. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
6. Where stud framing rests on concrete or masonry, extend lower edge of sheet at least 4 inches (100 mm) below bottom of framing and seal to foundation with sealant.
7. Install air barrier and vapor retarder UNDER jamb flashings.
8. Install head flashings under weather barrier.
9. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

E. Openings and Penetrations in Exterior Weather Barriers:
1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto weather barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.
2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches (230 mm) wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches (50 mm) beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 **PROTECTION**

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

END OF SECTION

SECTION 074646
FIBER-CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiber-cement siding.

1.02 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing: Siding substrate.

B. Section 054000 - Cold-Formed Metal Framing: Water-resistive barrier under siding.

C. Section 072500 - Weather Barriers: Weather barrier under siding.

D. Section 099113 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets 2008 (Reapproved 2016).

1.04 SUBMITTALS

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

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Manufacturer's requirements for related materials to be installed by others.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods, including nail patterns.
   5. Product Sample: Submit sample of manufacturer's fiber-cement materials to be included within the project.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products under waterproof cover and elevated above grade, on a flat surface.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

A. Panel Siding: Vertically oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Texture: Smooth.
   2. Length (Height): 96 inches (2400 mm), nominal.
   3. Width: 48 inches (1220 mm).
   4. Thickness: 5/16 inch (8 mm), nominal.
   5. Finish: Factory applied primer.
   6. Color: As indicated on drawings.
   7. Warranty: 50 year limited; transferable.
   8. Manufacturers:
      a. Allura, a division of Plycem USA, Inc; 4/4 Reversible Trim: www.allurausa.com/#sle.
      b. James Hardie Building Products, Inc; Hardietrim Boards: www.jameshardie.com/#sle.
      c. Or equal..

d. Substitutions: See Section 016000 - Product Requirements.

2.02 **ACCESSORIES**

A. Trim: Brake metal trim pre-finished to match window and door frames.

B. Fiber Cement Siding Metal Trim: Pre-finished metal of standard profiles and custom profiles to match anodized aluminum storefront window framing.
   1. Dimension and Layout: As indicated on drawings.
   2. Finish: Primed and painted metal to match siding.
   3. Manufacturers:
      a. James Hardie Building Products, Inc; Z Flashing and J Trim; www.jameshardie.com..
      b. Or equal.
      c. Substitutions: See Section 016000 - Product Requirements.

C. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch (32 mm).

D. Sealant: Elastomeric, polyurethane or silyl-terminated polyether/polyurethane, and capable of being painted.

E. Finish Paint: Latex exterior paint acceptable to siding manufacturer; primer recommended by paint manufacturer. Reference Exterior Wall Materials Legend (A6.0) within construction drawings.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that water-resistive barrier has been installed over substrate completely and correctly.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 **PREPARATION**

A. Install Sheet Metal Flashing:
   1. Above door and window trim and casings.
   2. Above horizontal trim in field of siding.
   3. Base of wall condition to direct water out and away from wall system.

3.03 **INSTALLATION**

A. Install in accordance with manufacturer's instructions and recommendations.
   1. Read warranty and comply with terms necessary to maintain warranty coverage.
   2. Use trim details indicated on drawings.
   3. Touch up field cut edges before installing.
   4. Pre-drill nail holes if necessary to prevent breakage.

B. Over Oriented Strand Board (OSB) Sheathing: Read and comply with sheathing manufacturer's recommendations.

C. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.

D. Do not install siding less than 6 inches (150 mm) from surface of ground nor closer than 1 inch (25 mm) to roofs, patios, porches, and other surfaces where water may collect.

E. After installation, seal joints between vertical siding boards and any trim; seal around penetrations, and paint exposed cut edges.

F. Finish Painting: Within one week after installation, paint siding and trim with one coat primer and two coats finish paint.

3.04 **PROTECTION**

A. Protect installed products until Date of Substantial Completion.

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

END OF SECTION

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.

B. Sealants for joints within sheet metal fabrications.

C. Precast concrete splash pads.

1.02 RELATED REQUIREMENTS

A. Section 042000 - Unit Masonry: Metal flashings embedded in masonry.

B. Section 061000 - Rough Carpentry: Wood nailers for sheet metal work.

C. Section 076100 - Sheet Metal Roofing.

D. Section 079200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

E. Section 074111 - Metal Roof Panels: Flashing sleeves and collars for mechanical items protruding through roofing membrane.

F. Section 074113 - Metal Roof Panels: Flashing sleeves and collars for electrical items protruding through roofing membrane.

1.03 REFERENCE STANDARDS

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.

F. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.

G. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

H. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007, with Editorial Revision (2012).

I. CDA A4050 - Copper in Architecture - Handbook current edition.

J. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples, 12 by 12 inch (304.8 by 304.8 mm) in size illustrating material of typical standing seam.

D. Samples: Submit two samples 6 by 6 inch (152.4 by 152.4 mm) in size illustrating metal finish color.

1.05 **QUALITY ASSURANCE**

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

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Sheet Metal Flashing and Trim Manufacturers:
   1. Petersen Aluminum Corporation; PAC Metal Roofing Trim and Wall Trim: www.pac-clad.com/#sle.
   2. Or equal.
   3. Substitutions: See Section 016000 - Product Requirements.

2.02 **SHEET MATERIALS**

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239) inch (0.61 mm) thick base metal, shop pre-coated with PVDF coating.
   1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As indicated on drawings.

B. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) (0.81 mm) thick; plain finish shop pre-coated with modified silicone coating.
   1. Modified Silicone Polyester Coating: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system.
   2. Color: As indicated on drawings.

C. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gage, (0.0156 inch) (0.40 mm) thick; smooth No. 4 - Brushed finish.

2.03 **FABRICATION**

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of galvanized or aluminum type sheet metal, minimum wide, interlocking with sheet.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.

G. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

2.04 **GUTTER AND DOWNSPOUT FABRICATION**

A. Gutters: SMACNA (ASMM) Square profile.

B. Downspouts: Round profile.

C. Gutters and Downspouts: Size indicated.

D. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Straps.

E. Splash Pads: Precast concrete type, of size and profiles indicated; minimum 3000 psi (21 MPa) at 28 days, with minimum 5 percent air entrainment.

F. Downspout Extenders: Same material and finish as downspouts.

G. Seal metal joints.

2.05 **ACCESSORIES**

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Protective Backing Paint: Zinc molybdate alkyd.

D. Concealed Sealants: Non-curing butyl sealant.

E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
   1. Manufacturers:
      a. Franklin International, Inc; Titebond WeatherMaster Metal Roof Sealant: www.titebond.com/#sle.
      b. Or equal.
      c. Substitutions: See Section 016000 - Product Requirements.

F. Plastic Cement: ASTM D4586/D4586M, Type I.

G. Reglets: Surface mounted type, galvanized steel.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 **PREPARATION**

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 **INSTALLATION**

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

E. Secure gutters and downspouts in place with concealed fasteners.

F. Slope gutters 1/4 inch per 10 feet (2.1 mm per m), minimum.

G. Set splash pads under downspouts, and set in place with bed of washed gravel around splash pad.

END OF SECTION

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SECTION 078400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 070553 - Fire and Smoke Assembly Identification.

C. Section 092116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2020.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems 2015 (Reapproved 2019).

D. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus 2020.

E. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies 2013 (Reapproved 2017).

F. ITS (DIR) - Directory of Listed Products current edition.

G. FM 4991 - Approval Standard for Firestop Contractors 2013.

H. FM (AG) - FM Approval Guide current edition.

I. UL 1479 - Standard for Fire Tests of Penetration Firestops Current Edition, Including All Revisions.

J. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems Current Edition, Including All Revisions.

K. UL (DIR) - Online Certifications Directory Current Edition.

L. UL (FRD) - Fire Resistance Directory Current Edition.

1.04 SUBMITTALS

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

B. Product Data: Provide data on product characteristics, performance ratings, and limitations.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Trained by manufacturer.

2. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
3. Verification of minimum three years documented experience installing work of this type.
4. Verification of at least five satisfactorily completed projects of comparable size and type.
5. Licensed by local authorities having jurisdiction (AHJ).

1.06 **FIELD CONDITIONS**

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

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Firestopping Manufacturers:
1. 3M Fire Protection Products; 3M Fire Barrier Sealant: www.3m.com/firestop/#sle.
2. Hilti, Inc; 601S Firestop Silicone Sealant: www.us.hilti.com/#sle.
3. Specified Technologies Inc; LCI Intumescent Firestop Sealant: www.stifirestop.com/#sle.
4. Tremco Commercial Sealants & Waterproofing; TREMstop Acrylic: www.tremcosealants.com/#sle.
5. Or equal.
6. Substitutions: See Section 016000 - Product Requirements.

2.02 **MATERIALS**

A. Firestopping Materials: Any materials meeting requirements.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

C. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 **FIRESTOPPING ASSEMBLY REQUIREMENTS**

A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
1. Movement: Provide systems that have been tested to show movement capability as indicated.
2. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
3. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
4. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.

B. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
1. Movement: Provide systems that have been tested to show movement capability as indicated.

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

D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
   2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
   3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
   4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.04 FIRESTOPPING FOR FLOOR-TO-FLOOR, WALL-TO-FLOOR, AND WALL-TO-WALL JOINTS

A. Gypsum Board Walls:
   1. Wall to Wall Joints That Have Not Been Tested For Movement Capabilities (Static):
      a. 2 Hour Construction: UL System WW-S-0063; Specified Technologies Inc. SpeedFlex TTG Track Top Gasket.
   2. Wall to Wall Joints That Have Movement Capabilities (Dynamic):
      a. 2 Hour Construction: UL System WW-D-0180; Specified Technologies Inc. SpeedFlex TTG Track Top Gasket.
      b. 2 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
   3. Wall to Roof Joints That Have Movement Capabilities (Dynamic):
      a. Joints between a fire-resistance-rated wall assembly and a non-fire-resistance-rated roof assembly are not specifically applicable to Section 731.1 of the International Building Code. Joints for such conditions involving 2-hour or greater fire-resistance-rated wall assembly shall be constructed similar to UL HW-D-0489 or per instruction from the local authority having jurisdiction.

2.05 FIRESTOPPING FOR FLOOR-TO-WALL JOINTS

B. Floor-To-Wall Joint System That Have Movement Capabilities (Dynamic):
   1. 2 Hour Construction: UL System FW-D-1069; Tremco, TREMstop Acrylic Firestop Sealant.

2.06 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

C. Blank Openings:
   1. 2 Hour Construction: UL System W-L-0020; Specified Technologies Inc. Composite Sheet.
   2. 2 Hour Construction: UL System W-L-0032; Specified Technologies Inc. FP Intumescent Firestop Plug.
   3. 2 Hour Construction: UL System W-L-0038; Specified Technologies Inc. FP Intumescent Firestop Plug.
   4. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.

D. Penetrations By:
   1. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System W-L-1033; Specified Technologies Inc. SIL silicone sealant.
      b. 2 Hour Construction: UL System W-L-1042; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).
      c. 2 Hour Construction: UL System W-L-1049; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
      d. 2 Hour Construction: UL System W-L-1090; Specified Technologies Inc. LC Endothermic Firestop Sealant.
      e. 2 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      f. 2 Hour Construction: UL System W-L-1164; Hilti FS-ONE MAX Intumescent Firestop Sealant.

g. 2 Hour Construction: UL System W-L-1222; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
h. 2 Hour Construction: UL System W-L-1477; Specified Technologies Inc. EZ Firestop Grommet.

2. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System W-L-2048; Specified Technologies Inc. SSW wrap strips.
   b. 2 Hour Construction: UL System W-L-2074; Specified Technologies Inc. SSC collars.
   c. 2 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.
   d. 2 Hour Construction: UL System W-L-2128; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   e. 2 Hour Construction: UL System W-L-2237; Specified Technologies Inc. LCC Intumescent Firestop Collars.
   f. 2 Hour Construction: UL System W-L-2241; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).
   g. 2 Hour Construction: UL System W-L-2243; Specified Technologies Inc. SSW wrap strips.
   h. 2 Hour Construction: UL System W-L-2493; Specified Technologies Inc. RTC range-taking collar.
3. Electrical Cables Not In Conduit:
   a. 2 Hour Construction: UL System W-L-3024; Specified Technologies Inc. SSP Firestop Putty.
   b. 2 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
   c. 2 Hour Construction: UL System W-L-3076; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
   d. 2 Hour Construction: UL System W-L-3084; Specified Technologies Inc. SSB Intumescent Firestop pillows.
   e. 2 Hour Construction: UL System W-L-3135; Specified Technologies Inc. SSP Firestop Putty.
   f. 2 Hour Construction: UL System W-L-3169; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
   g. 2 Hour Construction: UL System W-L-3218; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.
   h. 2 Hour Construction: UL System W-L-3255; Specified Technologies Inc. EZ-Path Series 22 Fire-Rated Pathway.
   i. 2 Hour Construction: UL System W-L-3256; Specified Technologies Inc. EZ-Path Series 22 Fire-Rated Pathway.
   j. 2 Hour Construction: UL System W-L-3265; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.
   k. 2 Hour Construction: UL System W-L-3303; Specified Technologies Inc. Ready Split Sleeve.
   l. 2 Hour Construction: UL System W-L-3306; Specified Technologies Inc. EZ-Path Series 44 Fire-Rated Pathway.
   m. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
   n. 2 Hour Construction: UL System W-L-3350; Specified Technologies Inc. LC Endothermic Firestop Sealant.
   o. 2 Hour Construction: UL System W-L-3357; Specified Technologies Inc. FP Intumescent Firestop Plug.
   p. 2 Hour Construction: UL System W-L-3358; Specified Technologies Inc. Ready Split Sleeve.
   q. 2 Hour Construction: UL System W-L-3358; Specified Technologies Inc. Ready-Sleeve.

4. Insulated Pipes:
   a. 2 Hour Construction: UL System W-L-5014; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   c. 2 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.
   d. 2 Hour Construction: UL System W-L-5121; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
   e. 2 Hour Construction: UL System W-L-5273; Specified Technologies Inc. LC Endothermic Firestop Sealant.
5. HVAC Ducts, Insulated:
   a. 2 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-L-7164; Specified Technologies Inc. FyreFlange HVAC Firestop Angle.
   c. 2 Hour Construction: UL System W-L-7238; Specified Technologies Inc. FyreFlange HVAC Firestop Angle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

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SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

B. Section 072500 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.

C. Section 078400 - Firestopping: Firestopping sealants.

D. Section 087100 - Door Hardware: Setting exterior door thresholds in sealant.

E. Section 088000 - Glazing: Glazing sealants and accessories.

F. Section 092116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

G. Section 092216 - Non-Structural Metal Framing: Sealing between framing and adjacent construction in acoustical and sound-rated walls and ceilings.

H. Section 093000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

I. Section 233100 - HVAC Ducts and Casings: Duct sealants.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer 2015.

B. ASTM C834 - Standard Specification for Latex Sealants 2017.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.

E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants 2008 (Reapproved 2012).

F. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants 2018.

G. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness 2015e1.

H. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension 2016.

1.04 SUBMITTALS

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

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.

6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
7. Sample product warranty.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Installation Plan: Submit at least four weeks prior to start of installation.

F. Installation Log: Submit filled out log for each length or instance of sealant installed.

1.05 **QUALITY ASSURANCE**

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Installation Plan: Include schedule of sealed joints, including the following.
1. Installation Log Form: Include the following data fields, with known information filled out.
a. Unique identification of each length or instance of sealant installed.
b. Location on project.
c. Sealant used.
d. Primer to be used, or indicate as "No primer" used.
e. Size and actual backing material used.
f. Date of installation.
g. Name of installer.
h. Actual joint width; provide space to indicate maximum and minimum width.
i. Actual joint depth to face of backing material at centerline of joint.
j. Air temperature.

1.06 **WARRANTY**

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
1. Bostik Inc: www.bostik-us.com/#sle.
2. Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
3. Hilti, Inc: www.us.hilti.com/#sle.
4. Pecora Corporation: www.pecora.com/#sle.
5. Sika Corporation: www.usa-sika.com/#sle.
6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
7. Or equal..
8. Substitutions: See Section 016000 - Product Requirements.

B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
1. Bostik Inc: www.bostik-us.com/#sle.

2. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
3. Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
4. Pecora Corporation: www.pecora.com/#sle.
5. Sika Corporation: www.usa-sika.com/#sle.
6. Or equal..
7. Substitutions: See Section 016000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
   a. Wall expansion and control joints.
   b. Joints between door, window, and other frames and adjacent construction.
   c. Joints between different exposed materials.
   d. Openings below ledge angles in masonry.
   e. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
   a. Joints between door, window, and other frames and adjacent construction.
   b. Joints between countertops and backsplashes and wall surfaces.
   c. Other joints indicated below.
3. Do not seal the following types of joints.
   a. Intentional weepholes in masonry.
   b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
   c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   d. Joints where installation of sealant is specified in another section.
   e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
2. Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing.
3. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic grade" sealant.

C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
2. Floor Joints in Wet Areas: Non-sag polyurethane "traffic-grade" sealant suitable for continuous liquid immersion.
3. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; color to be selected from color card submittal.
4. Narrow Control Joints in Interior Concrete Slabs: Self-leveling epoxy sealant.

D. Interior Wet Areas: Bathrooms, restrooms, and kitchens; fixtures in wet areas include plumbing fixtures and countertops.

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with levels of volatile organic compound (VOC) content as indicated in Section 016116.

2.04 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: +/- 50%, minimum.
2. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
3. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
4. Color: To be selected by Architect from manufacturer's standard range.
5. Cure Type: Single-component, neutral moisture curing.
6. Service Temperature Range: -40 to 300 degrees F (-40 to 149 degrees C).
7. Manufacturers:
   a. Dow Chemical Company; DOWSIL 756 SMS Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   b. Dow Chemical Company; DOWSIL 790 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   c. Dow Chemical Company; DOWSIL 791 Silicone Weatherproofing Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   d. Dow Chemical Company; DOWSIL 795 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   e. Sika Corporation; Sikasil WS-290: www.usa-sika.com/#sle.
   f. Sika Corporation; Sikasil WS-295: www.usa-sika.com/#sle.
   g. Sika Corporation; Sikasil 728NS: www.usa-sika.com/#sle.
   h. Or equal.
   i. Substitutions: See Section 016000 - Product Requirements.

B. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Cure Type: Single-component, neutral moisture curing
5. Service Temperature Range: Minus 65 to 180 degrees F (Minus 54 to 82 degrees C).
6. Manufacturers:
   a. Dow Chemical Company; DOWSIL 999-A Building and Glazing Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   b. Sika Corporation; Sikasil GP: www.usa-sika.com/#sle.
   c. Sika Corporation; Sikasil WS-295: www.usa-sika.com/#sle.
   d. Sika Corporation; Sikasil N-Plus US: www.usa-sika.com/#sle.
   e. Sika Corporation; Sikasil 728NS: www.usa-sika.com/#sle.
   f. Or equal.
   g. Substitutions: See Section 016000 - Product Requirements.

C. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Manufacturers:
   a. Pecora Corporation; 898 NST: www.pecora.com/#sle.
   b. Sika Corporation; Sikasil GP: www.usa-sika.com/#sle.
   c. Or equal.
   d. Substitutions: See Section 016000 - Product Requirements.

D. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).
5. Manufacturers:
   a. Sika Corporation; Sikaflex-1a: www.usa-sika.com/#sle.

b. Sika Corporation; Sikaflex-15 LM: www.usa-sika.com/#sle.
c. Sika Corporation; Sikaflex-2c NS: www.usa-sika.com/#sle.
d. Tremco Commercial Sealants & Waterproofing; Dymeric 240 FC: www.tremcosealants.com/#sle.
e. W. R. Meadows, Inc; POURTHANE NS: www.wrmeadows.com/#sle.
f. Or equal.
g. Substitutions: See Section 016000 - Product Requirements.

E. Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 40 to 50, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).

F. Epoxy Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
1. Hardness Range: 65 to 75, Shore A, when tested in accordance with ASTM C661.
2. Color: To be selected by Architect from manufacturer's standard range.
3. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).

G. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Grade: ASTM C834; Grade - Minus 18 Degrees C.
3. Manufacturers:
a. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
b. Top Gun, a brand of PPG Architectural Coatings; Top Gun 200: www.ppgpaints.com/#sle.
c. Tremco Commercial Sealants & Waterproofing; Tremflex 834: www.tremcosealants.com/#sle.
d. Or equal.
e. Substitutions: See Section 016000 - Product Requirements.

2.05 SELF-LEVELING SEALANTS

A. Self-Leveling Silicone Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
2. Hardness Range: 0 to 15, Shore A, when tested in accordance with ASTM C661.
3. Color: Gray.
4. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).
5. Manufacturers:
a. Dow Chemical Company; DOWSIL FC Parking Structure Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
b. Sika Corporation; Sikasil 728RCS: www.usa-sika.com/#sle.
c. Sika Corporation; Sikasil 728SL: www.usa-sika.com/#sle.
d. Or equal.
e. Substitutions: See Section 016000 - Product Requirements.

B. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
1. Movement Capability: Plus and minus 25 percent, minimum.

2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
3. Color: Gray.
4. Manufacturers:
   a. Sika Corporation; Sikaflex-1c SL: www.usa-sika.com/#sle.
   b. Sika Corporation; Sikaflex-2c SL: www.usa-sika.com/#sle.
   c. Or equal.
   d. Substitutions: See Section 016000 - Product Requirements.

C. Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
1. Composition: Multi-component, 100 percent solids by weight.
2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
3. Color: To be selected by Architect from manufacturer's standard colors.
4. Joint Width, Minimum: 1/8 inch (3 mm).
5. Joint Depth: Provide product suitable for joints from 1/8 inch (3 mm) to 2 inches (51 mm) in depth including space for backer rod.
6. Manufacturers:
   a. Euclid Chemical Company; EUCO 700: www.euclidchemical.com/#sle.
   b. Or equal.
   c. Substitutions: See Section 016000 - Product Requirements.

2.06 **ACCESSORIES**

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
3. Open Cell: 40 to 50 percent larger in diameter than joint width.
4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
5. Manufacturers:
   a. Nomaco, Inc; HBR: www.nomaco.com/#sle.
   b. Or equal..
   c. Substitutions: See Section 016000 - Product Requirements.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 **PREPARATION**

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.03 **INSTALLATION**

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 **FIELD QUALITY CONTROL**

A. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.05 **POST-OCCUPANCY**

A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at low temperature in thermal cycle. Report failures immediately and repair.

END OF SECTION

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SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Thermally insulated hollow metal doors with frames.

E. Accessories, including glazing.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

B. Section 088000 - Glazing: Glass for doors and borrowed lites.

C. Section 099113 - Exterior Painting: Field painting.

D. Section 099123 - Interior Painting: Field painting.

1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. HMMA: Hollow Metal Manufacturers Association.

C. NAAMM: National Association of Architectural Metal Manufacturers.

D. NFPA: National Fire Protection Association.

E. SDI: Steel Door Institute.

F. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2011.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames 2003 (R2009).

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2011.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable 2018.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014.

K. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames 2016.

L. FEMA P-361 - Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms 2015.

M. ICC 500 - ICC/NSSA Standard for the Design and Construction of Storm Shelters; National Storm Shelter Association 2014.

N. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

O. NAAMM HMMA 805 - Recommended Selection and Usage Guide for Hollow Metal Doors and Frames 2012.

P. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames 2002.

Q. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames 2011.

R. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames 2007.

S. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.

T. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.

U. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2016.

V. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.

W. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames 2013.

X. UL 10B - Standard for Fire Tests of Door Assemblies Current Edition, Including All Revisions.

Y. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

Z. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.05 **SUBMITTALS**

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

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, frame attachment methods, and any indicated finish requirements.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Fleming Door Products, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   4. Mesker, dormakaba Group; FDJ Series Drywall Frames: www.meskeropeningsgroup.com/#sle.
   5. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
   6. Or equal.
   7. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Manufacturers standard for application indicated.
   5. Typical Door Face Sheets: Flush.
   6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
   7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Type B , Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch (0.8 mm), minimum.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
      a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
   3. Door Thermal Resistance: R-Value of 6.0 minimum, for installed thickness of polystyrene.
   4. Door Thickness: 1-3/4 inch (44.5 mm), nominal.
   5. Weatherstripping: Refer to Section 087100.

C. Type E , Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch (0.8 mm), minimum.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inch (44.5 mm), nominal.

D. Type D , Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch (0.8 mm), minimum.

2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
3. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
4. Provide units listed and labeled by UL (DIR) or ITS (DIR).
   a. Attach fire rating label to each fire rated unit.
5. Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
   a. Maximum Air Leakage: 3.0 cfm/sq ft (0.02 cu m/sec/sq m) of door opening at 0.10 inch w.g. (24.9 Pa) pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
   b. Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
   c. Label: Include the "S" label on fire-rating label of door.
6. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
7. Door Thickness: 1-3/4 inch (44.5 mm), nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Exterior Door Frames: Full profile/continuously welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   2. Frame Metal Thickness: 14 gage, 0.067 inch (1.7 mm), minimum.
   3. Frame Finish: Factory primed and field finished.
   4. Weatherstripping: Separate, see Section 087100.

C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
   2. Frame Finish: Factory primed and field finished.

D. Door Frames, Fire-Rated: Full profile/continuously welded type.
   1. Fire Rating: Same as door, labeled.
   2. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
   3. Frame Finish: Factory primed and field finished.

E. Frames for Wood Doors: Specified in Section 08113_3.04.C and 08113_3.04.D - Hollow Metal Doors and Frames.

F. Frames Wider than 48 inches (1219 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Glazing: As specified in Section 088000, factory installed.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.
   1. Manufacturers:
      a. ITW Commercial Construction North America; ITW CCNA-Buildex Teks Select Series; [_____]: www.ITWBuildex.com/#sle.

b. Or equal.
c. Substitutions: See Section 016000 - Product Requirements.

D. Grout for Frames: Portland cement grout with maximum 4 inch (102 mm) slump for hand troweling; thinner pumpable grout is prohibited.

E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 **INSTALLATION**

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Install door hardware as specified in Section 087100.
1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

F. Comply with glazing installation requirements of Section 088000.

G. Coordinate installation of electrical connections to electrical hardware items.

H. Touch up damaged factory finishes.

3.03 **TOLERANCES**

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.04 **ADJUSTING**

A. Adjust for smooth and balanced door movement.

3.05 **SCHEDULE**

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

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SECTION 081213
HOLLOW METAL FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal frames for non-hollow metal doors.

B. Fire-rated hollow metal frames for non-hollow metal doors.

1.02 RELATED REQUIREMENTS

A. Section 081416 - Flush Wood Doors: Non-hollow metal door for hollow metal frames.

B. Section 087100 - Door Hardware: Hardware, silencers, and weatherstripping.

C. Section 088000 - Glazing: Glazed borrowed lites.

D. Section 099123 - Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2011.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames 2003 (R2009).

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2011.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable 2018.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.

I. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames 2016.

J. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

K. ITS (DIR) - Directory of Listed Products current edition.

L. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames 2002.

M. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames 2011.

N. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2007.

O. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.

P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.

Q. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2019.

R. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames 2013.

S. UL (DIR) - Online Certifications Directory Current Edition.

T. UL 10B - Standard for Fire Tests of Door Assemblies Current Edition, Including All Revisions.

U. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

V. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 **SUBMITTALS**

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

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Installer's Qualification Statement.

1.05 **QUALITY ASSURANCE**

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Store in accordance with applicable requirements and in compliance with standards and/or custom guidelines as indicated.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Hollow Metal Frames with Integral Casings:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Fleming Door Products, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   4. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
   5. Or equal.
   6. Substitutions: See Section 016000 - Product Requirements.

2.02 **PERFORMANCE REQUIREMENTS**

A. Refer to Door and Frame Schedule on the drawings for frame sizes, fire ratings, sound ratings, finishing, door hardware to be installed, and other variations, if any.

B. Door Frame Type: Provide hollow metal door frames with integral casings.
   1. Interior Doors: Use frames with integral casings.

C. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.

D. Accessibility: Comply with ICC A117.1 and ADA Standards.

E. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior frame that is also indicated as being sound-rated must comply with the requirements specified for exterior frames and for sound-rated frames; where two requirements conflict, comply with the most stringent.

F. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830, NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

2.03 **HOLLOW METAL DOOR FRAMES WITH INTEGRAL CASINGS**

A. Frame Finish: Factory primed and field finished.

B. Type 2 , Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Frame Metal Thickness: 18 gage, 0.042 inch (1.0 mm), minimum.

C. Type 3 , Fire-Rated Door Frames: Full profile/continuously welded type.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Frame Metal Thickness: 18 gage, 0.042 inch (1.0 mm), minimum.
   2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C or NFPA 252 ("positive pressure fire tests").
   3. Temperature-Rise Rating (TRR) Across Framed Door Thickness: In accordance with local building code and authorities having jurisdiction.
   4. Provide units listed and labeled by ITS (DIR) or UL (DIR).
      a. Attach fire rating label to each fire rated unit.
   5. Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing framed doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
      a. Maximum Air Leakage: 3.0 cfm/sq ft (0.02 cu m/sec/sq m) of framed door opening at 0.10 inch w.g. (24.9 Pa) pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
      b. Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
      c. Label: Include the "S" label on fire-rating label of door.

2.04 **FINISHES**

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.05 **ACCESSORIES**

A. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

B. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 **INSTALLATION**

A. Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Install door hardware as specified in Section 087100.

1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

E. Coordinate installation of electrical connections to electrical hardware items.

F. Touch up damaged factory finishes.

3.03 **TOLERANCES**

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edges, crossed corner to corner.

3.04 **SCHEDULE - SEE DRAWINGS**

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 081416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; fire-rated and non-rated.

1.02 RELATED REQUIREMENTS

A. Section 081213 - Hollow Metal Frames.

B. Section 087100 - Door Hardware.

C. Section 088000 - Glazing.

D. Section 099123 - Interior Painting: Field finishing of doors.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard 2012.

B. ANSI A208.1 - American National Standard for Particleboard 2009.

C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.

D. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights 2007 (Reapproved 2016).

E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards 2014, with Errata (2016).

F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1 2016, with Errata (2017).

G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.

H. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2016.

I. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.

J. UL (DIR) - Online Certifications Directory Current Edition.

K. UL 10B - Standard for Fire Tests of Door Assemblies Current Edition, Including All Revisions.

L. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

M. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

N. WDMA I.S. 1A - Interior Architectural Wood Flush Doors 2013.

1.04 SUBMITTALS

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

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Samples: Submit two samples of door veneer, 12 by 12 inch (304.8 by 304.8 mm) in size illustrating wood grain, stain color, and sheen.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

F. Manufacturer's Installation Instructions: Indicate special installation instructions.

G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than 5 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than 5 years of documented experience.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 **WARRANTY**

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Wood Veneer Faced Doors:
   1. Construction Specialties, Inc; Acrovyn Flush Doors: www.c-sgroup.com/#sle.
   2. Haley Brothers: www.haleybros.com/#sle.
   3. Marshfield DoorSystems, Inc; Impressions: www.marshfielddoors.com/#sle.
   4. Oregon Door; Architectural Series: www.oregondoor.com/#sle.
   5. Or equal.
   6. Substitutions: See Section 016000 - Product Requirements.

2.02 **DOORS**

A. Doors: Refer to drawings for locations and additional requirements.
   1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
   3. Smoke and Draft Control Doors (Indicated as "S" on Drawings): In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm per sq ft (0.01524 cu m/s/sq m) of door opening at 0.10 inch wg (24.9 Pa) pressure at both ambient and elevated temperatures for "S" label; if necessary, provide additional gasketing or edge sealing.
   4. Wood veneer facing for field opaque finish as indicated on drawings.

2.03 **DOOR AND PANEL CORES**

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 **DOOR FACINGS**

A. Veneer Facing for Opaque Finish: Closed grain hardwood veneer, in compliance with indicated quality standard.

B. Facing Adhesive: Type I - waterproof.

2.05 **DOOR CONSTRUCTION**

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.
   2. Provide solid blocking for other throughbolted hardware.

C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
   1. Exception: Doors to be field finished.

F. Provide edge clearances in accordance with the quality standard specified.

2.06 **FACTORY FINISHING - WOOD VENEER DOORS**

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Opaque:
      a. System 1 - Opaque primer compatible with interior acrylic latex field paint..
      b. Color: Primer color per door manufacturer.
      c. Sheen: Flat.

2.07 **ACCESSORIES**

A. Hollow Metal Door Frames: As specified in Section 081213.

B. Glazed Openings:
   1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
   2. Glazing: Single vision units, 1/4 inch (6.4 mm) thick glass.
   3. Tint: Clear.

C. Glazing Stops: Rolled steel channel shape, butted corners; prepared for countersink style tamper proof screws.

D. Door Hardware: As specified in Section 087100.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 **INSTALLATION**

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.
   2. Install smoke and draft control doors in accordance with NFPA 105 requirements.
   3. Install exterior doors in accordance with ASTM E2112.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Field-Finished Doors: Trimming to fit is acceptable.

1. Adjust width of non-rated doors by cutting equally on both jamb edges.
2. Trim maximum of 3/4 inch (19 mm) off bottom edges.
3. Trim fire-rated doors in strict compliance with fire rating limitations.

D. Use machine tools to cut or drill for hardware.

E. Coordinate installation of doors with installation of frames and hardware.

F. Coordinate installation of glazing.

3.03 **TOLERANCES**

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 **ADJUSTING**

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 **SCHEDULE**

A. Refer to Door and Frame Schedule appended to this section.

END OF SECTION

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

D. Door hardware.

1.02 RELATED REQUIREMENTS

A. Section 072500 - Weather Barriers: Sealing framing to weather barrier installed on adjacent construction.

B. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 084229 - Automatic Entrances.

D. Section 087100 - Door Hardware: Hardware items other than specified in this section.

E. Section 088000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site 2015.

B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems 2015.

C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.

D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).

E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections 2009.

F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.

H. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).

I. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014.

J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

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

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
   1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

D. Samples: Submit two samples 12 x 12 inches (304.8 x 304.8 mm) in size illustrating finished aluminum surface, glass, glazing materials.

E. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

F. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 **QUALITY ASSURANCE**

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Tennessee.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 **DELIVERY, STORAGE, AND HANDLING**

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 **FIELD CONDITIONS**

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.09 **WARRANTY**

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 **BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING**

A. Center-Set Style, Thermally-Broken:
   1. Basis of Design: Kawneer; TriFab 451UT Framing System, 2 by 4-1/2 inch Storefront Center-Set Style, Thermally Borken: www.kawneer.com.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep (51 mm wide by 114 mm deep).

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. YKK AP America Inc; YES 45XT High Performance Storefront: www.ykkap.com/#sle.
   2. Tubelite Inc.; TU24000 Therml=Block: www.tubeliteinc.com.
   3. Oldcastle Building Envelope; Series 3000XT Storefront: www.obe.com.
   4. Or equal.

C. Substitutions: See Section 016000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 **BASIS OF DESIGN -- SWINGING DOORS**

A. Medium Stile, Insulating Glazing, Thermally-Broken:
   1. Basis of Design: Kawneer; 350T Insulpour Thermal Entrance: www.kawneer.com..
   2. Thickness: 2-1/4 inches (57.1 mm).

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. YKK AP America Inc.: www.ykkap.com/#sle.
   2. Oldcastle Building Envelope; www.obe.com
   3. Tubelite Inc.; www.tubeliteinc.com.
   4. Or equal.

C. Substitutions: See Section 016000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.03 **STOREFRONT**

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Unitized, shop assembly.
   2. Glazing Rabbet: For 1 inch (25 mm) insulating glazing.
   3. Finish: Class I color anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
   4. Finish Color: Black anodized.
   5. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   8. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   9. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   10. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements:
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Design Wind Loads: Comply with requirements of ASCE 7.
      b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf (

390 Pa).

3. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft (0.3 L/sec sq m) of wall area, when tested in accordance with ASTM E283 at 6.27 psf (300 Pa) pressure differential across assembly.
4. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.

2.04 **COMPONENTS**

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Glazing Stops: Flush.
   2. Cross-Section: 2 by 4-1/2 inchnominal dimension.
   3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Glazing: As specified in Section 088000.
   1. For Exterior Framing: Type 1" Insulated.

C. Swing Doors: Glazed aluminum.
   1. Thickness: 2-1/4".
   2. Top Rail: 3-1/2 inches (88.9 mm) wide.
   3. Vertical Stiles: 3-1/2 inches (88.9 mm) wide.
   4. Bottom Rail: 10 inches (254 mm) wide.
   5. Glazing Stops: Square.
   6. Finish: Same as storefront.

D. Operable Sash: Aluminum project-out awning; finished to match storefront; turn handle latch.

2.05 **MATERIALS**

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel to be non-corrosive and compatible with aluminum-framed door members, trim hardware, anchors, and other components.

C. Concealed Flashings: Stainless steel, 26 gage, 0.0187 inch (0.48 mm) minimum thickness.

D. Concealed Flashings: Sheet aluminum, 26 gage, 0.017 inch (0.43 mm) minimum thickness.

E. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

F. Sealant for Setting Thresholds: Non-curing butyl type.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

H. Glazing Accessories: As specified in Section 088000.

2.06 **FINISHES**

A. Class I Color Anodized Finish: AAMA 611 AA-M10C21A44 Integrally colored anodic coating not less than 0.7 mils (0.018 mm) thick.

B. Color: As indicated on drawings.

2.07 **HARDWARE**

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

D. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

E. Pivots: Offset type; top and bottom.

F. Push/Pull Set: Standard configuration push/pull handles.

G. Exit Devices:
   1. Provide on doors as indicated.
H. Door Closers: Exposed overhead.
   1. Provide on doors as indicated.
I. Locks: Integral to exit devices .
   1. Provide on doors as indicated.
J. Automatic Door Operators and Actuators: As specified in Section 084229.
   1. Provide on doors as indicated.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify dimensions, tolerances, and method of attachment with other work.
B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 **INSTALLATION**

A. Install wall system in accordance with manufacturer's instructions.
B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
C. Provide alignment attachments and shims to permanently fasten system to building structure.
D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
E. Provide thermal isolation where components penetrate or disrupt building insulation.
F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
I. Install operating sash.
J. Set thresholds in bed of sealant and secure.
K. Install hardware using templates provided.
   1. See Section 087100 for hardware installation requirements.
L. Install glass in accordance with Section 088000, using glazing method required to achieve performance criteria.
M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 **TOLERANCES**

A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.
B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 **FIELD QUALITY CONTROL**

A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.

3.05 **ADJUSTING**

A. Adjust operating hardware and sash for smooth operation.

3.06 **CLEANING**

SECTION 087100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, aluminum, and hollow metal doors.

B. Hardware for fire-rated doors.

C. Thresholds.

D. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealants for setting exterior door thresholds.

B. Section 081113 - Hollow Metal Doors and Frames.

C. Section 081116 - Aluminum Doors and Frames.

D. Section 081416 - Flush Wood Doors.

E. Section 084313 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.

F. Section 284600 - Fire Detection and Alarm: Electrical connection to activate door closers.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. BHMA (CPD) - Certified Products Directory 2017.

C. BHMA A156.1 - American National Standard for Butts and Hinges 2016.

D. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches 2017.

E. BHMA A156.3 - American National Standard for Exit Devices 2014.

F. BHMA A156.4 - American National Standard for Door Controls - Closers 2013.

G. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks 2014.

H. BHMA A156.6 - American National Standard for Architectural Door Trim 2015.

I. BHMA A156.7 - American National Standard for Template Hinge Dimensions 2016.

J. BHMA A156.15 - American National Standard for Release Devices - Closer Holder, Electromagnetic and Electromechanical 2015.

K. BHMA A156.16 - American National Standard for Auxiliary Hardware 2013.

L. BHMA A156.18 - American National Standard for Materials and Finishes 2016.

M. BHMA A156.21 - American National Standard for Thresholds 2014.

N. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association 2017.

O. BHMA A156.23 - American National Standard for Electromagnetic Locks 2010.

P. BHMA A156.25 - American National Standard for Electrified Locking Devices 2013.

Q. BHMA A156.26 - American National Standard for Continuous Hinges 2012.

R. BHMA A156.28 - American National Standard for Recommended Practices for Mechanical Keying Systems 2013.

S. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames 2016.

T. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames 2006.

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 A117.1 - Accessible and Usable Buildings and Facilities 2017.

X. ITS (DIR) - Directory of Listed Products current edition.

Y. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.

Z. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

AA. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2016.

BB. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.

CC. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure utility 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; attendance is required 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. Attendance Required:
      a. Contractor.
      b. Owner.
      c. Architect.
   2. Agenda:
      a. Establish keying requirements.
      b. Establish keying submittal schedule and update requirements.
   3. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
      a. Key control system requirements.
   4. Record minutes and distribute copies within five days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
   5. Deliver established keying requirements to manufacturers.

1.05 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: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.

1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
2. List groups and suffixes in proper sequence.
3. Provide complete description for each door listed.
4. Provide manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
1. Submit manufacturer's parts lists and templates.
2. Bitting List: List of combinations as furnished.

F. Keying Schedule:
1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

G. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

H. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

1.06 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 five years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.
1. Closers: Five years, minimum.
2. Exit Devices: Three years, minimum.
3. Locksets and Cylinders: Three years, minimum.
4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

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. Provide door hardware products that comply with the following requirements:
1. Applicable provisions of federal, state, and local codes.
2. Accessibility: ADA Standards and ICC A117.1.
3. Applicable provisions of NFPA 101.
4. Fire-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.

5. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
6. 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.
7. Listed and certified compliant with specified standards by BHMA (CPD).
8. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
9. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
10. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

D. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. Refer to Door Hardware Schedule.

E. 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. Provide spacers or sex bolts with sleeves for through bolting of hollow metal doors and frames.
6. Fire-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.
7. Concealed Fasteners: Do not use through or sex bolt type fasteners on door panel sides indicated as concealed fastener locations, unless otherwise indicated.

2.02 **HINGES**

A. Manufacturers:
1. Basis of Design: Hager Companies; BB1191; www.hagerco.com.
2. McKinney; an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. Hager Companies: www.hagerco.com/#sle.
4. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com/#sle.
5. Or equal.
6. Substitutions: See Section 016000 - Product Requirements.

B. Hinges: Comply with BHMA A156.1, Grade 1.
1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
   a. Provide hinge width required to clear surrounding trim.
2. Continuous Hinges: Comply with BHMA A156.26.
3. Provide hinges on every swinging door.
4. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
5. Provide ball-bearing hinges at each door with closer.
6. Provide non-removable pins on exterior outswinging doors.
7. Provide following quantity of butt hinges for each door:
   a. Doors up to 60 inches (1.5 m) High: Two hinges.
   b. Doors From 60 inches (1.5 m) High up to 90 inches (2.3 m) High: Three hinges.
   c. Doors 90 inches (2.3 m) High up to 120 inches (3 m) High: Four hinges.

2.03 **EXIT DEVICES**

A. Manufacturers:
   1. Basis of Design: Von Duprin, an Allegion brand; 33A/35A Series; www.allegion.com/us/#sle..
   2. Corbin Russwin, Sargent, or Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. DORMA USA, Inc; 8000 Series: www.dorma.com/#sle.
   4. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com/#sle.
   5. Or equal.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Exit Devices: Comply with BHMA A156.3, Grade 1.
   1. Lever design to match lockset trim.
   2. Provide cylinder with cylinder dogging or locking trim.
   3. Provide exit devices properly sized for door width and height.
   4. Provide strike as recommended by manufacturer for application indicated.
   5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.

2.04 **LOCK CYLINDERS**

A. Manufacturers:
   1. Basis of Design: Sargent an Assa Abloy company; www.assaabloydss.com.
   2. Schlage an Allegion brand: www.allegion.com/us
   3. Best, dormakaba Group: www.bestaccess.com/#sle.
   4. Or equal.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
   1. Provide standard, conventional, and full size interchangeable core (FSIC) type cylinders, Grade 1, with six-pin core in compliance with BHMA A156.5 at locations required.
   2. Provide cylinders from same manufacturer as locking device.
   3. Provide cams and/or tailpieces as required for locking devices.
   4. Within specific Door Sections, when provisions for lock cylinder are being referenced to this Section, provide specified lock cylinder and keyed to building keying system, unless otherwise indicated.

2.05 **CYLINDRICAL LOCKS**

A. Manufacturers:
   1. Basis of Design: Sargent as Assa Abloy company; Sargent 7-Line Series: www.sargentlock.com.
   2. Corbin Russwin, Sargent, or Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Schlage, an Allegion brand: www.allegion.com/us/#sle.
   4. Or equal.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
   1. Bored Hole: 2-1/8 inch (54 mm) diameter.
   2. Latchbolt Throw: 1/2 inch (12.7 mm), minimum.
   3. Backset: 2-3/4 inch (70 mm) unless otherwise indicated.
   4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
      a. Finish: To match lock or latch.
      b. Flat-Lip Strikes: Provide for locks with three piece antifriction latchbolts as recommended by manufacturer.

5. Provide a lock for each door, unless otherwise indicated that lock is not required.
6. Provide an office lockset for swinging door where hardware set is not indicated.
7. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.

2.06 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
1. Basis of Design: Hager Companies; Series 30S (Push) and Series 33 (Pull): www.hagerco.com.
2. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. Forms+Surfaces: www.forms-surfaces.com/#sle.
4. Pamex, Inc: www.pamexinc.com/#sle.
5. Or equal..
6. Substitutions: See Section 016000 - Product Requirements.

B. Door Pulls and Push Plates: Comply with BHMA A156.6.
1. Pull Type: Straight, unless otherwise indicated.
2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
   a. Edges: Beveled, unless otherwise indicated.
3. Material: Stainless steel, unless otherwise indicated.
4. Provide door pulls and push plates on doors without a lockset, latchset, exit device, or auxiliary lock unless otherwise indicated.
5. On solid doors, provide matching door pull and push plate on opposite faces.
6. On glazed storefront doors, provide matching door pulls/push plates on both faces per the storefront door manufacturer unless otherwise indicated.

2.07 DOOR PULLS AND PUSH BARS

A. Manufacturers:
1. Basis of Design: Round, tubular, horizontal bars across door from stile to stile per storefront door manufacturer..
2. Rockwood; an Assa Abloy Group company; Tubular: www.assaabloydss.com/#sle.
3. Or equal.
4. Substitutions: See Section 016000 - Product Requirements.

B. Door Pulls and Push Bars: Comply with BHMA A156.6.
1. Bar Type: Push bar, unless otherwise indicated.
2. Material: Aluminum to match storefront door, unless otherwise indicated.

2.08 CLOSERS

A. Manufacturers; Surface Mounted:
1. Basis of Design: LCN, an Allegion brand; 1000 Series: www.allegion.com/us/#sle.
2. Corbin Russwin, Norton, Rixson, Sargent, or Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. DORMA USA, Inc; 7400 Series, 8600 Series, 8900 Series, and TS93: www.dorma.com/#sle.
4. Or equal.
5. Substitutions: See Section 016000 - Product Requirements.

B. Closers: Comply with BHMA A156.4, Grade 1.
1. Type: Surface mounted to door.
2. Provide door closer on each exterior door.
3. Provide door closer on each fire-rated and smoke-rated door.
   a. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
4. At outswinging exterior doors, mount closer on interior side of door.
5. Reference hardware sets for mounting sides of door closer

2.09 KICK PLATES

A. Manufacturers:

1. Basis of Design: Hager Companies; Model 190S: hagerco.com/#sle.
2. Ives, an Allegion brand: www.allegion.com/us/#sle.
3. Trimco: www.trimcohardware.com/#sle.
4. Or equal.
5. Substitutions: See Section 016000 - Product Requirements.

B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
1. Size: 8 inch (203 mm) high by 2 inch (51 mm) less door width (LDW) on push side of door.

2.10 **FLOOR STOPS**

A. Manufacturers:
1. Basis of Design: Hager Companies: Model 241F: www.hagerco.com/#sle.
2. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. Trimco: www.trimcohardware.com/#sle.
4. Or equal.
5. Substitutions: See Section 016000 - Product Requirements.

B. Floor Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
1. Type: Manual hold-open, with dome floor stop.
2. Material: Aluminum housing with rubber insert.

2.11 **THRESHOLDS**

A. Manufacturers:
1. Basis of Design: Hager Companies; 5" Saddle Threshold (ADA Height): www.hagerco.com/#sle..
2. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. National Guard Products, Inc: www.ngpinc.com/#sle.
4. Or equal.
5. Substitutions: See Section 016000 - Product Requirements.

B. Thresholds: Comply with BHMA A156.21.
1. Provide threshold at each exterior door, unless otherwise indicated.
2. Type: Flat surface.
3. Material: Aluminum.
4. Threshold Surface: Fluted horizontal grooves across full width.
5. Field cut threshold to profile of frame and width of door sill for tight fit.
6. Provide non-corroding fasteners at exterior locations.

2.12 **WEATHERSTRIPPING AND GASKETING**

A. Manufacturers:
1. Basis of Design: Pemko, an Assa Abloy Compnay; Pemko Fire / Smoke Gasketing Model HSS2000X588: www.assaabloydss.com/#sle..
2. National Guard Products, Inc: www.ngpinc.com/#sle.
3. Reese Enterprises, Inc: www.reeseusa.com/#sle.
4. Or equal.
5. Substitutions: See Section 016000 - Product Requirements.

B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
1. Head and Jamb Type: Self-adhesive.
2. Door Sweep Type: Encased in retainer.
3. Material: Aluminum, with brush weatherstripping.
4. Provide gasketing for smoke and draft control doors (Indicated as "S" on Drawings) that complies with local codes, requirements of assemblies tested in accordance with UL 1784.

5. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated; .
6. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.13 **SILENCERS**

A. Manufacturers:
1. Basis of Design: Hager Companies; Model 307G; www.hagerco.com/#sle.
2. Ives, an Allegion brand: www.allegion.com/us/#sle.Ives, an Allegion brand: www.allegion.com/us/#sle.Ives, an Allegion brand: www.allegion.com/us/#sle.Ives, an Allegion brand: www.allegion.com/us/#sle.
3. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
4. Or equal..
5. Substitutions: See Section 016000 - Product Requirements.

B. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
1. Single Door: Provide three on strike jamb of frame.
2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
3. Material: Rubber, gray color.

2.14 **FINISHES**

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
1. Primary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
2. Secondary Finish: 630; satin stainless steel, with stainless steel 300 series base material (former US equivalent US32D); BHMA A156.18.; BHMA A156.18.
   a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.
3. Exceptions:
   a. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.
   b. Hinges for Fire-Rated Doors: Steel base material with painted finish, in compliance with NFPA 80.
   c. Door Closer Covers and Arms: Color as selected by Architect from manufacturer's standard colors unless otherwise indicated.
   d. Aluminum Surface Trim and Gasket Housings: Anodized to match door panel finish, not other hardware, unless otherwise indicated.
   e. Hardware for Aluminum Storefront Doors: Finished to match door panel finish.

PART 3 EXECUTION

3.01 **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.

3.02 **INSTALLATION**

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Install hardware for smoke and draft control doors in accordance with NFPA 105.

D. Use templates provided by hardware item manufacturer.

E. Do not install surface mounted items until application of finishes to substrate are fully completed.

F. 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 Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
   3. Flush Wood Doors: Refer to Section 081416.
   4. 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).

G. 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.
   1. Refer to Section 079200 for additional requirements.

3.03 **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.

3.04 **CLEANING**

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

D. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.05 **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.

END OF SECTION

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SECTION 088000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 081113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

C. Section 084313 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

D. Section 088300 - Mirrors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test 2015.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers 2005 (Reapproved 2015).

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

F. ASTM C1036 - Standard Specification for Flat Glass 2016.

G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.

I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass 2015.

J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings 2016.

K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation 2010.

L. GANA (SM) - GANA Sealant Manual 2008.

M. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.

N. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies 2017.

O. NFRC 100 - Procedure for Determining Fenestration Product U-factors 2017.

P. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence 2014, with Errata (2017).

Q. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems 2017.

R. UL 9 - Standard for Fire Tests of Window Assemblies Current Edition, Including All Revisions.

S. UL 10B - Standard for Fire Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data on Insulated Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch in size of glass units.

E. Samples: Submit 4 inch (101.6 mm) long bead of glazing sealant, color as selected.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 **FIELD CONDITIONS**

A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 **WARRANTY**

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Heat Soaked Tempered Glass: Provide a five (5) year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Glass Fabricators:
   Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle
   1. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
   2. Viracon, Inc: www.viracon.com/#sle.
   3. Or equal.
   4. Substitutions: Refer to Section 016000 - Product Requirements.

B. Float Glass Manufacturers:
   1. Pilkington North America Inc: www.pilkington.com/na/#sle.
   2. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
   3. Or equal.
   4. Substitutions: Refer to Section 016000 - Product Requirements.

C. Wired Glass Manufacturers:
   1. GGI - General Glass International; Wire Glass: www.generalglass.com/#sle.
   2. Or equal.
   3. Substitutions: Refer to Section 016000 - Product Requirements.

2.02 **PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES**

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with ASCE 7.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Seismic Loads: Design and size glazing components to withstand seismic loads and sway displacement in accordance with the requirements of ASCE 7

4. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
5. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
1. In conjunction with vapor retarder and joint sealer materials described in other sections.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
4. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.
5. Wired Glass Type: ASTM C1036, Type II - Wired Flat Glass, Quality - Q6, with color and performance characteristics as indicated.
6. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
1. Basis of Design: Vitro Architectural Glass (formerly PPG Glass); 1" glazing unit with 1/4" Clear Glass and 1/4" Clear Glass with Solaban 60 coating (2): vitroglazings.com/#sle. (Tempered glass as required)
2. Guardian Glass, LLC: www.guardianglass.com/#sle.
3. Pilkington North America Inc: www.pilkington.com/na/#sle.Pilkington North America Inc: www.pilkington.com/na/#sle.
4. Viracon, Apogee Enterprises, Inc: www.viracon.com/#sle.
5. Or equal.
6. Substitutions: Refer to Section 016000 - Product Requirements.

B. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Metal Edge Spacers: Aluminum, bent and soldered corners.
4. Spacer Color: Black.
5. Edge Seal:
   a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone sealant as secondary seal applied around perimeter.
   b. Color: Black.
6. Purge interpane space with dry air, hermetically sealed.

C. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.

2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
   a. Tint: Clear.
   b. Coating: Solarban 60, on #2 surface.
4. Inboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
   a. Tint: Clear.
5. Total Thickness: 1 inch (25.4 mm).
6. Thermal Transmittance (U-Value), Summer - Center og Glass: .29 nominal.
7. Visible Light Transmittance (VLT): 14 percent, nominal.
8. Solar Heat Gain Coefficient (SHGC): .17, nominal.
9. Glazing Method: Wet glazing method, sealant and sealant.

2.05 GLAZING UNITS

A. Type G-2 - Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Fully tempered float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch (6.4 mm), nominal.
   5. Glazing Method: Dry glazing method, gasket glazing.

B. Type G-10 - Wired Glass: Flat glass with embedded wire mesh.
   1. Applications: Locations as indicated on drawings.
   2. Form: Form 1 - Wired glass, polished both sides; ASTM C1036.
   3. Mesh: M1 - Diamond; ASTM C1036.
   4. Pattern and Finish: P1 - Linear, F1 - Patterned one side; ASTM C1036.
   5. Tint: Clear, Class 1.
   6. Glass Type: Annealed.
   7. Thickness: 1/4 inch (6.4 mm), nominal.
   8. Glazing Method: Dry glazing method, gasket glazing.
   9. Manufacturers:
      a. GGI - General Glass International; Wire Glass: www.generalglass.com/#sle.
      b. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite I-W: www.safti.com/#sle.
      c. Or equal.
      d. Substitutions: Refer to Section 016000 - Product Requirements.

2.06 GLAZING COMPOUNDS

A. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; Black color.

2.07 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch (75 mm) long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
   1. Width: As required for application.
   2. Thickness: As required for application.
   3. Spacer Rod Diameter: As required for application.

4. Manufacturers:
   a. Pecora Corporation: www.pecora.com/#sle.
   b. Tremco Global Sealants: www.tremcosealants.com/#sle.
   c. Or equal.
   d. Substitutions: Refer to Section 016000 - Product Requirements.

D. Glazing Splines: Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 **VERIFICATION OF CONDITIONS**

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 **PREPARATION**

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 **INSTALLATION, GENERAL**

A. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 **INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)**

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 **INSTALLATION - WET GLAZING METHOD (SEALANT AND SEALANT)**

A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

B. Place setting blocks at 1/4 points and install glazing pane or unit.

C. Install removable stops with glazing centered in space by inserting spacer shims both sides at 24 inch (610 mm) intervals, 1/4 inch (6.4 mm) below sight line.

D. Fill gaps between glazing and stops with silicone building sealant type sealant to depth of bite on glazing, but not more than 3/8 inch (9 mm) below sight line to ensure full contact with glazing and continue the air and vapor seal.

E. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.06 **CLEANING**

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove non-permanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 **PROTECTION**

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

3.08 **SCHEDULES**

A. Aluminum-Framed Storefront Glazing: Glass Type IG-1, install glass using dry method, and with glass thickness as required to comply with performance requirements indicated in Section 084313.

B. Steel Door Glazing:
   1. Fire-Rated: Glass Type G-10, 1/4 inch (6 mm) thick, install glass using wet method with Type GC- Silicone glazing compound.
   2. Interior: Glass Type G-2, 1/4 inch (6 mm) thick, install glass using wet method with Type GC- Silicone glazing compound.

END OF SECTION

SECTION 088300
MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass mirrors.
   1. Annealed float glass.

1.02 RELATED REQUIREMENTS

A. Section 102800 - Toilet, Bath, and Laundry Accessories: Metal mirror frames.

1.03 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

B. ASTM C1036 - Standard Specification for Flat Glass 2016.

C. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror 2018.

1.04 SUBMITTALS

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

B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds: Submit chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples, 4 x 4 inch (101.6 x 101.6 mm) in size, illustrating mirrors design, edging, and coloration.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 FIELD CONDITIONS

A. Do not install mirrors when ambient temperature is less than 50 degrees F (10 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mirrors:
   1. Binswanger Mirror/ACI Distribution: www.binswangerglass.com/#sle.
   2. Lenoir Mirror Co: www.lenoirmirror.com/#sle.
   3. Trulite Glass and Aluminum Solutions: www.trulite.com/#sle.
   4. Or equal.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass: Clear, annealed float glass, with copper and silver coatings, and protective overcoating.
   1. Thickness: 1/4 inch (6.4 mm).

2. Edges: Arrised.
3. Size: As indicated on drawings.

2.03 **ACCESSORIES**

A. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.
1. Application Temperature: Minus 35 to 140 degrees F (Minus 37 to 60 degrees C) at contact surfaces.
2. Volatile Organic Content (VOC): Less than 7 percent by weight.
3. Manufacturers:
a. Liquid Nails, a brand of PPG Architectural Coatings; LN-730 Mirror Adhesive: www.liquidnails.com/#sle.
b. Or equal.
c. Substitutions: See Section 016000 - Product Requirements.

B. Channel Frame: One piece, channel frame, stainless steel, Type 430, satin finish, 1/2 inch by 1/2 inch by 3/8 inch deep (12.7 mm by 12.7 mm by 9.5 mm deep) with 90 degree mitered corners. Bottom edge only.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that openings for mirrored glazing are correctly sized and within tolerance.

B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 **PREPARATION**

A. Clean contact surfaces with solvent and wipe dry.

3.03 **INSTALLATION**

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

D. Frameless Mirrors: Set mirrors in proper place with adhesive, applied in accordance with adhesive manufacturer's instructions. Rest bottom edge of mirror firmly within channel frame anchored to wall.

3.04 **CLEANING**

A. Remove wet glazing materials from finish surfaces.

B. Remove labels after work is complete.

C. Clean mirrors and adjacent surfaces.

END OF SECTION

SECTION 090561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Carpet tile.

B. Preparation of new concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs for moisture and alkalinity (pH).

D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

E. Patching compound.

F. Remedial floor coatings.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens) 2020a.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete 2020.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2019, with Editorial Revision (2020).

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride 2016a.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes 2019a.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.05 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

B. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Product data for recommended remedial coating.

7. Include certification of accuracy by authorized official of testing agency.
8. Submit report to Architect.
9. Submit report not more than five business days after conclusion of testing.

C. Adhesive Bond and Compatibility Test Report.

D. Floor Moisture Testing Technician Certificate: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician- Grade I certificate.

1.06 **QUALITY ASSURANCE**

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

D. Floor Moisture Testing Technician Qualifications: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician Certification- Grade I.

E. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.07 **FIELD CONDITIONS**

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 **MATERIALS**

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
4. Products:
   a. TEC, an H.B. Fuller Construction Products Brand; TEC Feather Edge Skim Coat: www.tecspecialty.com/#sle.
   b. Or equal.
   c. Substitutions: See Section 016000 - Product Requirements.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
   1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
   2. Use product recommended by testing agency.
   3. Products:

PART 3 EXECUTION

3.01 **CONCRETE SLAB PREPARATION**

A. Follow recommendations of testing agency.

B. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.
   3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Specified remediation, if required.
   6. Patching, smoothing, and leveling, as required.
   7. Other preparation specified.
   8. Adhesive bond and compatibility test.
   9. Protection.

C. Remediations:
   1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
   2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
   3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 **PRELIMINARY CLEANING**

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.03 **MOISTURE VAPOR EMISSION TESTING**

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.

F. Report: Report the information required by the test method.

3.04 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.05 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
   1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
   2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch (25 mm) in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
   3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.

C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.06 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with recommendations of testing agency.

C. Comply with requirements and recommendations of floor covering manufacturer.

D. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

E. Do not fill expansion joints, isolation joints, or other moving joints.

3.07 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.08 **APPLICATION OF REMEDIAL FLOOR COATING**

A. Comply with requirements and recommendations of coating manufacturer.

3.09 **PROTECTION**

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

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SECTION 092116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal stud wall framing.
B. Metal channel ceiling framing.
C. Acoustic insulation.
D. Gypsum sheathing.
E. Gypsum wallboard.
F. Joint treatment and accessories.
G. Water-resistive barrier over exterior wall sheathing.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
B. Section 054000 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.
C. Section 061000 - Rough Carpentry: Building framing and sheathing.
D. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.
E. Section 072100 - Thermal Insulation: Acoustic insulation.
F. Section 072500 - Weather Barriers: Water-resistive barrier over sheathing.
G. Section 078400 - Firestopping: Top-of-wall assemblies at fire rated walls.
H. Section 079200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.
I. Section 092216 - Non-Structural Metal Framing.
J. Section 093000 - Tiling: Tile backing board.
K. Section 313116 - Termite Control: Field-applied termiticide and mildewcide for metal framing.

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute 2012.
B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.
D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members 2015.
E. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2015.
F. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2014, with Editorial Revision (2015).
G. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
H. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2017.
I. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2018b.
J. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84

mm) in Thickness 2015.

K. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2016.

L. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base 2014a.

M. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2013.

N. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing 2018.

O. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.

P. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels 2018.

Q. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2016.

R. GA-216 - Application and Finishing of Gypsum Panel Products 2016.

S. GA-600 - Fire Resistance Design Manual 2015.

1.04 **SUBMITTALS**

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

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on metal framing, gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 **QUALITY ASSURANCE**

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum five years of experience.

PART 2 PRODUCTS

2.01 **GYPSUM BOARD ASSEMBLIES**

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. Fire Rated Partitions: as indicated on drawings.
   2. Head of Fire Rated Partitions: Reference Section 078400 - Firestopping and sub-section 2.04.A.3 - Wall-to-Roof Joints.
   3. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 **METAL FRAMING MATERIALS**

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich; www.clarkdietrich.com/#sle.
   2. Marino: www.marinoware.com/#sle.
   3. Or equal.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Exterior Non-Loadbearing Studs for Application of Gypsum Board: As specified in Section 092216.

C. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).
   1. Studs: "C" shaped with flat or formed webs with knurled faces.

2. Runners: U shaped, sized to match studs.
3. Ceiling Channels: C-shaped.
4. Furring: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).

D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot dipped galvanized coating.
3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems specified in Section 078400.
4. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-rating of the wall assembly.
a. Products:
1) FireTrak Corporation; Posi Klip.
2) Metal-Lite, Inc; The System.
3) Or equal.
4) Substitutions: See Section 016000 - Product Requirements.

E. Non-Loadbearing Framing Accessories:
1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
b. Height: 35-3/4 inches (908 mm).
c. Products:
1) ClarkDietrich; Pony Wall (PW): www.clarkdietrich.com/#sle.
2) Or equal.
3) Substitutions: See Section 016000 - Product Requirements.
3. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.
a. Products:
1) ClarkDietrich; FastBridge Clip (FB33): www.clarkdietrich.com/#sle.
2) Or equal.
3) Substitutions: See Section 016000 - Product Requirements.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
1. American Gypsum Company: www.americangypsum.com/#sle.
2. CertainTeed Corporation: www.certainteed.com/#sle.
3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
4. National Gypsum Company: www.nationalgypsum.com/#sle.
5. USG Corporation: www.usg.com/#sle.
6. Or equal.
7. Substitutions: See Section 016000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Glass mat faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.

4. Thickness:
   a. Vertical Surfaces: 5/8 inch (16 mm).
   b. Ceilings: 5/8 inch (16 mm).
   c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
5. Paper-Faced Products:
   a. American Gypsum Company; LightRoc Gypsum Wallboard.
   b. American Gypsum Company; FireBloc Type X Gypsum Wallboard.
   c. CertainTeed Corporation; Type C Drywall.
   d. CertainTeed Corporation; Type X Drywall.
   e. Georgia-Pacific Gypsum; ToughRock.
   f. Georgia-Pacific Gypsum; ToughRock Fireguard X.
   g. Georgia-Pacific Gypsum; ToughRock Fireguard C.
   h. National Gypsum Company; Gold Bond BRAND Fire-Shield Gypsum Board.
   i. Or equal.
   j. Substitutions: See Section 016000 - Product Requirements.
6. Glass Mat Faced Products:
   a. Georgia-Pacific Gypsum; DensGlass Sheathing.
   b. Georgia-Pacific Gypsum; DensArmor Plus.
   c. Georgia-Pacific Gypsum; DensArmor Plus Fireguard C.
   d. USG Corporation; USG Sheetrock Brand Glass-Mat Panels Mold Tough.
   e. Or equal.
   f. Substitutions: See Section 016000 - Product Requirements.

C. Backing Board For Wet Areas: Reference Section 093000 - Tiling
   1. Application: Surfaces behind tile in wet areas including wet wall in restrooms.

D. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
   1. Application: Exterior sheathing, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
   4. Core Type: Regular.
   5. Regular Board Thickness: 5/8 inch (16 mm).
   6. Edges: Square.
   7. Glass Mat Faced Products:
      a. American Gypsum Company; M-Glass Exterior Sheathing.
      b. CertainTeed Corporation; GlasRoc Type X Exterior Sheathing.
      c. Continental Building Products; Weather Defense Platinum Exterior Sheathing.
      d. Georgia-Pacific Gypsum; DensGlass Sheathing.
      e. Or equal.
      f. Substitutions: See Section 016000 - Product Requirements.

2.04 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3-1/2 inch (88.9 mm).

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Water-Resistive Barrier: As specified in Section 072500.

D. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
   1. Corner Beads: Low profile, for 90 degree outside corners.
      a. Products:
         1) CertainTeed Corporation; No-Coat Drywall Corner: www.certainteed.com/#sle.
         2) ClarkDietrich; Strait-Flex Big-Stick: www.clarkdietrich.com/#sle.

3) Phillips Manufacturing Co; Everlast Corner Bead: www.phillipsmfg.com/#sle.
4) Or equal.
5) Substitutions: See Section 016000 - Product Requirements.

2. L-Trim with Tear-Away Strip: Sized to fit 5/8 inch (15.9 mm) thick gypsum wallboard.
   a. Products:
      1) Phillips Manufacturing Co; gripSTIK L-Tear: www.phillipsmfg.com/#sle.
      2) Or equal.
      3) Substitutions: See Section 016000 - Product Requirements.
3. Expansion Joints:
   a. Type: V-shaped PVC with tear away fins.
   b. Products:
      1) Phillips Manufacturing Co; 093 Expansion Control Joint: www.phillipsmfg.com/#sle.
      2) Or equal.
      3) Substitutions: See Section 016000 - Product Requirements.

E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Fiberglass Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
   2. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
   3. Products:
      a. Continental Building Products: www.continental-bp.com/#sle.
      b. Or equal.
      c. Substitutions: See Section 016000 - Product Requirements.
   4. Joint Compound: Drying type, vinyl-based, ready-mixed.
      a. Products:
         1) CertainTeed Corporation; Extreme All-Purpose Joint Compound: www.certainteed.com/#sle.
         2) Or equal.
         3) Substitutions: See Section 016000 - Product Requirements.
   5. Joint Compound: Setting type, field-mixed.

F. Finishing Compound: Surface coat and primer, takes the place of skim coating.
   1. Products:
      a. CertainTeed Corporation; Quick Prep Plus Interior Prep Coat: www.certainteed.com/#sle.
      b. Or equal.
      c. Substitutions: See Section 016000 - Product Requirements.

G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members at 16 inches on center (at 400 mm on center).

1. Level ceiling system to a tolerance of 1/1200.
2. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center (at 406 mm on center).
1. Extend partition framing to structure in all locations.
2. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Furring for Fire Ratings: Install as required for fire resistance ratings indicated and to GA-600 requirements.

F. Blocking: Install wood blocking for support of:
1. Framed openings.
2. Wall mounted cabinets.
3. Plumbing fixtures.
4. Toilet partitions.
5. Toilet accessories.
6. Wall mounted door hardware.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

E. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:

1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
2. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
   2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.

3.07 **TOLERANCES**

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

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SECTION 092216
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

1.02 RELATED REQUIREMENTS

A. Section 052100 - Steel Joists: Execution requirements for anchors for attaching work of this section.

B. Section 054000 - Cold-Formed Metal Framing: Exterior wall stud framing.

C. Section 054000 - Cold-Formed Metal Framing: Execution requirements for anchors for attaching work of this section.

D. Section 055000 - Metal Fabrications: Metal fabrications attached to stud framing.

E. Section 055000 - Metal Fabrications: Execution requirements for anchors for attaching work of this section.

F. Section 061000 - Rough Carpentry: Wood blocking within stud framing.

G. Section 061000 - Rough Carpentry: Wall sheathing.

H. Section 072100 - Thermal Insulation: Acoustic insulation.

I. Section 072500 - Weather Barriers.

J. Section 076200 - Sheet Metal Flashing and Trim: Head and sill flashings

K. Section 078400 - Firestopping: Sealing top-of-wall assemblies at fire rated walls.

L. Section 079200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

M. Section 085113 - Aluminum Windows: Product requirements for window anchors.

N. Section 092116 - Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

O. Section 092116 - Gypsum Board Assemblies: Execution requirements for anchors for attaching work of this section.

P. Section 313116 - Termite Control: Field-applied termiticide and mildewcide for metal framing.

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute 2012.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.

D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members 2015.

E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2014, with Editorial Revision (2015).

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.

G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2017.

H. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2016.

I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

1.04 **SUBMITTALS**

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

B. Shop Drawings:
   1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
   2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.

C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 **QUALITY ASSURANCE**

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich: www.clarkdietrich.com/#sle.
   2. Marino: www.marinoware.com/#sle.
   3. R-stud, LLC: www.rstud.com/#sle.
   4. The Steel Network, Inc: www.SteelNetwork.com/#sle.
   5. Or equal.
   6. Substitutions: See Section 016000 - Product Requirements.

2.02 **FRAMING MATERIALS**

A. Fire Rated Assemblies: Comply with applicable code and as indicated on drawings.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf (L/240 at 240 Pa).
   1. Studs: C shaped with flat or formed webs with knurled faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C shaped.
   4. Furring: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).

C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
   2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating.
   3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.
   4. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet (3660 mm).

D. Preformed Top Track Firestop Seal:
   1. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.
   2. Products:
      a. Hilti, Inc; Top Track Seal CFS TTS: www.us.hilti.com/#sle.
      b. Or equal.
      c. Substitutions: See Section 016000 - Product Requirements.

E. Non-Loadbearing Framing Accessories:
   1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
   2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
      a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
      b. Height: 35-3/4 inches (908 mm).
      c. Products:
         1) ClarkDietrich; Pony Wall (PW): www.clarkdietrich.com/#sle.
         2) Or equal.
         3) Substitutions: See Section 016000 - Product Requirements.
   3. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.
      a. Products:
         1) ClarkDietrich; FastBridge Clip (FB33): www.clarkdietrich.com/#sle.
         2) Or equal.
         3) Substitutions: See Section 016000 - Product Requirements.
   4. Fasteners: ASTM C1002 self-piercing tapping screws.
   5. Anchorage Devices: Powder actuated.
   6. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3-1/2" inch (88.9 mm).
   7. Acoustic Insulation: As specified in Section 072100.
   8. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.

2.03 **FABRICATION**

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

3.02 **INSTALLATION OF STUD FRAMING**

A. Comply with requirements of ASTM C754.

B. Extend partition framing to structure in all locations.

C. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

D. Align and secure top and bottom runners at 24 inches (600 mm) on center.

E. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

F. Install studs vertically at 16 inches (400 mm) on center.

G. Align stud web openings horizontally.

H. Secure studs to tracks using fastener method. Do not weld.

I. Stud splicing is not permissible.

J. Fabricate corners using a minimum of three studs.

K. Double stud at wall openings, door and window jambs, not more than 2 inches (50 mm) from each side of openings.

L. Brace stud framing system rigid.

M. Coordinate erection of studs with requirements of door frames; install supports and attachments.

N. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

O. Blocking: Use wood blocking secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and opening frames.

P. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches (150 mm).

3.03 **CEILING AND SOFFIT FRAMING**

A. Comply with requirements of ASTM C754.

B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

C. Install furring independent of walls, columns, and above-ceiling work.

D. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

E. Space main carrying channels at maximum 72 inch (1 800 mm) on center, and not more than 6 inches (150 mm) from wall surfaces. Lap splice securely.

F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

G. Place furring channels perpendicular to carrying channels, not more than 2 inches (50 mm) from perimeter walls, and rigidly secure. Lap splices securely.

H. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches (600 mm) past each opening.

I. Laterally brace suspension system.

3.04 **TOLERANCES**

A. Maximum Variation From True Position: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation From Plumb: 1/8 inch in 10 feet (3 mm in 3 m).

END OF SECTION

SECTION 093000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

D. Ceramic accessories.

E. Ceramic trim.

F. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium). 2017.

B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar 2014.

C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar 2017.

D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement 1999 (Reaffirmed 2016).

E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive 2009 (Revised).

F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar 1999 (Reaffirmed 2010).

G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy 1999 (Reaffirmed 2010).

H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout 1999 (Reaffirmed 2010).

I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout 1999 (Reaffirmed 2010).

J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework 2017.

K. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2010 (Reaffirmed 2016).

L. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar 1999 (Reaffirmed 2010).

M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone 2005 (Reaffirmed 2010).

N. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive

2013 (Revised).

O. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar 2012 (Revised).

P. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation 2010 (Reaffirmed 2016).

Q. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units 1999 (Reaffirmed 2016).

R. ANSI A137.1 - American National Standard Specifications for Ceramic Tile 2012.

S. ASTM C150/C150M - Standard Specification for Portland Cement 2018.

T. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products 2017.

U. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel 2013.

V. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation 2017.

1.04 **SUBMITTALS**

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

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 12 by 12 inches (304.8 by 304.8 mm) in size illustrating pattern, color variations, and grout joint size variations.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Tile: 5 percent of each size, color, and surface finish combination, but not less than 3 of each type.

1.05 **QUALITY ASSURANCE**

A. Maintain one copy of and ANSI A108/A118/A136 and TCNA (HB) on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 **FIELD CONDITIONS**

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of mortar materials.

PART 2 PRODUCTS

2.01 **TILE**

A. Manufacturers:

1. American Olean Corporation: www.americanolean.com/#sle.
2. Dal-Tile Corporation: www.daltile.com/#sle.
3. Emser Tile, LLC: www.emser.com/#sle.
4. Stonepeak Ceramics, Inc.: www.stonepeakceramics.com
5. Or equal.
6. Substitutions: See Section 016000 - Product Requirements.

B. Porcelain Tile, Type CT: ANSI A137.1 standard grade.
1. Basis of Design: Stonepeak Ceramics Inc. - Sky Collection "Nightsky"
2. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
3. Size: 12 by 24 inch (304.8 by 610 mm), nominal.
4. Thickness: 1/3 inch (8.5 mm).
5. Edges: Rectified.
6. Surface Finish: Unglazed.
7. Color(s): As indicated on drawings.
8. Pattern: Stacked bond.
9. Trim Units: Matching bullnose and cove base shapes in sizes coordinated with field tile.
10. Products:
    a. Bullnose Trim - Stonepeak Sky (3"x12").
    b. Cove Base - Stonepeak Sky (6"x12").
    c. Or equal.
    d. Substitutions: See Section 016000 - Product Requirements.

C. Porcelain Floor Tile, Type CT: ANSI A137.1 standard grade.
1. Basis of Design: Stonepeak Ceramics Inc. - Sky Collection "Nightsky"
2. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
3. Size: 12 by 24 inch , nominal.
4. Thickness: [1/3] inch.
5. Edges: Rectified.
6. Surface Finish: Unglazed.
7. Color(s): As indicated on drawings.
8. Pattern: Stacked bond.
9. Substitutions: See Section 016000-Products Requirements.

2.02 TRIM AND ACCESSORIES

A. Ceramic Trim: Matching bullnose and cove base ceramic shapes in sizes coordinated with field tile.
1. Applications:
    a. Open Edges: Bullnose.
    b. Inside Corners: Coved.
    c. Floor to Wall Joints: Cove base.
2. Manufacturers: Same as for tile.

B. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
1. Applications:
    a. Transition between floor finishes of differing height: Basis of Design - Schluter Systems "Reno-U" (Tile restroom floor to concrete slab)
2. Manufacturers:
    a. Schluter-Systems: www.schluter.com/#sle.
    b. Or equal.
    c. Substitutions: See Section 016000 - Product Requirements.

2.03 **SETTING MATERIALS**

A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
   2. Bostik Inc: www.bostik-us.com/#sle.
   3. Custom Building Products: www.custombuildingproducts.com/#sle.
   4. LATICRETE International, Inc: www.laticrete.com/#sle.
   5. Or equal.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
   1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
   2. Products:
      a. ARDEX Engineered Cements; ARDEX N 23 MICROTEC: www.ardexamericas.com/#sle.
      b. Custom Building Products; ProLite Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.
      c. Merkrete, by Parex USA, Inc; Merkrete 735 Premium Flex: www.merkrete.com/#sle.
      d. Or equal.
      e. Substitutions: See Section 016000 - Product Requirements.

2.04 **GROUTS**

A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
   2. Bostik Inc: www.bostik-us.com/#sle.
   3. Custom Building Products: www.custombuildingproducts.com/#sle.
   4. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
   5. Or equal.
   6. Substitutions: See Section 016000 - Product Requirements.

B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
   1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
   2. Use sanded grout for joints 1/8 inch (3.2 mm) wide and larger; use unsanded grout for joints less than 1/8 inch (3.2 mm) wide. Use unsanded grout for joints in all glazed tiles.
   3. Color(s): As selected by Architect from manufacturer's full line.
   4. Products:
      a. ARDEX Engineered Cements; ARDEX FL: www.ardexamericas.com/#sle.
      b. Custom Building Products; Fusion Pro Single Component Grout: www.custombuildingproducts.com/#sle.
      c. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
      d. Or equal.
      e. Substitutions: See Section 016000 - Product Requirements.

2.05 **MAINTENANCE MATERIALS**

A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
   1. Applications: Between tile and plumbing fixtures.
   2. Color(s): As selected by Architect from manufacturer's full line.
   3. Products:
      a. ARDEX Engineered Cements; ARDEX SX: www.ardexamericas.com/#sle.
      b. Custom Building Products; Commercial 100% Silicone Caulk: www.custombuildingproducts.com/#sle.

c. LATICRETE International, Inc; LATICRETE LATASIL: www.laticrete.com/#sle.
d. Or equal.
e. Substitutions: See Section 016000 - Product Requirements.

2.06 **ACCESSORY MATERIALS**

A. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch (12.7 mm) thick; 2 inch (51 mm) wide coated glass fiber tape for joints and corners. Do not use in wet locations.
1. Products:
a. Custom Building Products; WonderBoard Lite Backerboard: www.custombuildingproducts.com/#sle.
b. Or equal.
c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 **PREPARATION**

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.03 **INSTALLATION - GENERAL**

A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Install thresholds where indicated.

I. Sound tile after setting. Replace hollow sounding units.

J. Keep control and expansion joints free of mortar, grout, and adhesive.

K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

L. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 **INSTALLATION - FLOORS - THIN-SET METHODS**

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.

1. Use uncoupling membrane under all tile unless other underlayment is indicated.

3.05 **INSTALLATION - WALL TILE**

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.

3.06 **CLEANING**

A. Clean tile and grout surfaces.

3.07 **PROTECTION**

A. Do not permit traffic over finished floor surface for 4 days after installation.

3.08 **SCHEDULE**

A. Reference Finish Plan and Finish Legend within drawings (A12.0).

END OF SECTION

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 233700 - Air Outlets and Inlets: Air diffusion devices in ceiling.

C. Section 265100 - Interior Lighting: Light fixtures in ceiling system.

1.03 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2017.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2013.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2020.

E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2014.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

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

B. Product Data: Provide data on suspension system components.

C. Samples: Submit two samples 12 by 12 inch (304.8 by 304.8 mm) in size illustrating material and finish of acoustical units.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: 50 sq ft ([____] sq m) of each type and size.

1.06 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

1.07 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrong.com/#sle.

2. CertainTeed Corporation: www.certainteed.com/#sle.
3. Hunter Douglas Architectural; Techstyle Series: www.hunterdouglasarchitectural.com/#sle.
4. USG: www.usg.com/#sle.
5. Or equal.
6. Substitutions: See Section 016000 - Product Requirements.

B. Suspension Systems:
1. Same as for acoustical units.
2. Substitutions: See Section 016000 - Product Requirements.

2.02 **ACOUSTICAL UNITS**

A. Acoustical Panels: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
1. Size: 24 by 48 inches (600 by 1200 mm).
2. Thickness: 5/8 inches (15 mm).
3. Composition: Wet felted.
4. Light Reflectance: 82 percent, determined in accordance with ASTM E1264.
5. NRC Range: .55 to .65, determined in accordance with ASTM E1264.
6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
7. Edge: Square.
8. Surface Color: White.
9. Surface Pattern: Non-directional fissured.
10. Suspension System: Exposed grid.
11. Products:
a. Armstrong Ceiling and Wall Solutions: Fine Fissured - Angled Tegular (1733); www.armstrongceilings.com.
b. Or equal..

2.03 **SUSPENSION SYSTEM(S)**

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

B. Exposed Steel Suspension System: Formed galvanized steel, commercial quality cold rolled; heavy-duty.
1. Profile: Tee; 15/16 inch (24 mm) wide face.
2. Construction: Double web.
3. Finish: White painted.
4. Products:
a. Armstrong Ceiling and Wall Solutions: Prelude XL 15/16" Exposed Tee; www.armstrongceilings.com.
b. Or equal.
c. Substitutions: See Section 016000 - Product Requirements.

2.04 **ACCESSORIES**

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 **INSTALLATION - SUSPENSION SYSTEM**

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design as indicated on drawings. if field conditions differ, notify achitect for approval. Adjust with edge units no less than 50 percent of acoustical unit size.

D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches (150 mm) of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.

3.03 **INSTALLATION - ACOUSTICAL UNITS**

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units with pattern parallel to shortest room axis.

D. Fit border trim neatly against abutting surfaces.

E. Install units after above-ceiling work is complete.

F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

G. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges.

H. Where round obstructions occur, provide preformed closures to match perimeter molding.

3.04 **TOLERANCES**

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

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SECTION 096813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

B. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

C. Section 090561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials 2016.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2019.

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride 2016a.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes 2018.

E. CRI 104 - Standard for Installation of Commercial Carpet 2015.

1.04 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Tile Carpeting:
   1. Interface, Inc: www.interface.com/#sle.
   2. Milliken & Company: www.milliken.com/#sle.
   3. Mohawk Group: www.mohawkgroup.com/#sle.
   4. Or equal.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 **MATERIALS**

A. Tile Carpeting, Type C-1: Fusion bonded, manufactured in one color dye lot.
   1. Product: SL920 Silver Linings - Style #138780AK00 manufactured by Interface.
   2. Tile Size: 9-3/4 by 39-3/8 inch (247.6 by 1000 mm), nominal.
   3. Color: 104514 Nickel Line.
   4. Pattern: Ashlar.

2.03 **ACCESSORIES**

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Rubber, Reference Finish Schedule for color.

C. Adhesives:
   1. Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified; in lieu of labeled product, independent test report showing compliance is acceptable.

D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 090561.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
   3. Follow moisture and alkalinity remediation procedures in Section 090561.

D. Verify that required floor-mounted utilities are in correct location.

3.02 **PREPARATION**

A. Prepare floor substrates for installation of flooring in accordance with Section 090561.

3.03 **INSTALLATION**

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Locate change of color or pattern between rooms under door centerline.
G. Fully adhere carpet tile to substrate.
H. Trim carpet tile neatly at walls and around interruptions.
I. Complete installation of edge strips, concealing exposed edges.

3.04 **CLEANING**

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
B. Clean and vacuum carpet surfaces.

END OF SECTION

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SECTION 099113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Exposed surfaces of steel lintels and ledge angles.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Non-metallic roofing and flashing.
   6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
   7. Floors, unless specifically indicated.
   8. Ceramic and other types of tiles.
   9. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
   10. Glass.
   11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 055000 - Metal Fabrications: Shop-primed items.

C. Section 099123 - Interior Painting.

D. Section 099600 - High-Performance Coatings.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

C. SCAQMD 1113 - Architectural Coatings 1977 (Amended 2016).

D. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1 2016.

E. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

F. SSPC-SP 6 - Commercial Blast Cleaning 2007.

1.04 SUBMITTALS

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

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").

2. MPI product number (e.g. MPI #47).
3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
4. Manufacturer's installation instructions.
5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit two paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
3. Allow 10 days for approval process, after receipt of complete samples by Architect.

D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.06 MOCK-UP

A. See Section 014000 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 2 feet (610 m) long by 2 feet (610 m) wide, illustrating paint color, texture, and finish.

C. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
   2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.
   3. Substitution of a different paint system using MPI-approved products by the same manufacturer will be considered.

B. Paints:
   1. PPG Paints: www.ppgpaints.com/#sle.
   2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   3. Farrell Calhoun Paints; www.farrellcalhoun.com.
   4. Or equal.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 016000 - Product Requirements.

2.02 **PAINTS AND FINISHES - GENERAL**

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 016116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated in Color Schedule.
   1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 **PAINT SYSTEMS - EXTERIOR**

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including fiber cement siding and primed metal.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.
      a. Products:
         1) PPG Paints Speedhide Exterior Latex Satin, 6-2045XI Series. (MPI #15)
         2) PPG Paints Fortis 350 Exterior Latex Satin, 2402G Series. (MPI #214)
         3) Or equal.
         4) Substitutions: Section 016000 - Product Requirements.
   3. Top Coat Sheen:
      a. Satin: MPI gloss level 4; use this sheen at all locations.
   4. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 **PRIMERS**

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Alkali Resistant Water Based Primer; MPI #3.
      a. Products:
         1) PPG Paints Seal Grip Acrylic Primer, 17-921 Series. (MPI #3)
         2) PPG Paints Perma-Crete Interior/Exterior Alkali Resistant Primer, 4-603 Series. (MPI #3)
         3) Or equal.
         4) Substitutions: Section 016000 - Product Requirements.
   2. Interior/Exterior Quick Dry Alkyd Primer for Metal; MPI #76.
      a. Products:
         1) PPG Devguard Multi-Purpose Primer, 4160 Series. (MPI #76)
         2) Or equal.
         3) Substitutions: Section 016000 - Product Requirements.

2.05 **ACCESSORY MATERIALS**

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Fiber Cement Siding: 12 percent.

3.02 **PREPARATION**

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

G. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

H. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 **APPLICATION**

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Sand metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 **FIELD QUALITY CONTROL**

A. See Section 014000 - Quality Requirements, for general requirements for field inspection.

3.05 **CLEANING**

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 **PROTECTION**

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.07 **COLOR SCHEDULE**

A. Fiber-Cement Siding: Sherwin Williams SW6258 "Tricorn Black"

B. Hollow Metal Doors and Frames: Sherwin Williams SW7674 "Peppercorn"

END OF SECTION

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SECTION 099123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
      d. Paint dampers exposed behind louvers, grilles, to match face panels.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
   6. Floors, unless specifically indicated.
   7. Ceramic and other tiles.
   8. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   9. Glass.
   10. Acoustical materials, unless specifically indicated.
   11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 055000 - Metal Fabrications: Shop-primed items.

C. Section 099113 - Exterior Painting.

D. Section 099600 - High-Performance Coatings.

E. Section 230553 - Identification for HVAC Piping and Equipment: Painted identification.

F. Section 260553 - Identification for Electrical Systems: Painted identification.

G. Section 321723.13 - Painted Pavement Markings: Painted pavement markings.

1.03 REFERENCE STANDARDS

A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2016.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

C. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

D. SSPC-SP 2 - Hand Tool Cleaning 2018.

E. SSPC-SP 3 - Power Tool Cleaning 2018.

F. SSPC-SP 6 - Commercial Blast Cleaning 2007.

G. SSPC-SP 13 - Surface Preparation of Concrete 1997 (Reaffirmed 2003).

1.04 **SUBMITTALS**

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

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.

C. Samples: Submit two paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
   3. Allow 10 days for approval process, after receipt of complete samples by Architect.
   4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.05 **QUALITY ASSURANCE**

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.06 **MOCK-UP**

A. See Section 014000 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 2 feet (610 m) long by 2 feet (610 m) wide, illustrating paint color, texture, and finish.

C. Mock-up may remain as part of the work.

1.07 **DELIVERY, STORAGE, AND HANDLING**

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 **FIELD CONDITIONS**

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F (3 degrees C) above the dew point; or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

B. Paints:
   1. PPG Paints: www.ppgpaints.com/#sle.
   2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   3. Farrell Calhoun Paints: www.farrellcalhoun.com.
   4. Or equal.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 016000 - Product Requirements.

2.02 **PAINTS AND FINISHES - GENERAL**

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 016116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.
   1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 **PAINT SYSTEMS - INTERIOR**

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board and wood.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Interior Latex; MPI #43, 44, 52, 53, 54, or 114.
      a. Products:
         1) PPG Paints Speedhide zero Latex, 6-4110XI Series, Flat. (MPI #53)
         2) PPG Paints Ultra-Hide 150 Interior Low Sheen Paint, 1410-XXXXV, Eggshell. (MPI #44)
         3) Sherwin-Williams Harmony Interior Acrylic Latex, Flat. (MPI #53)
         4) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Eg-Shel. (MPI #52)
         5) Or equal.
         6) Substitutions: Section 016000 - Product Requirements.
   3. Top Coat Sheen:
      a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
      b. Eggshell: MPI gloss level 3; use this sheen at all walls and wood doors.
   4. Primer: As recommended by top coat manufacturer for specific substrate.

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
   1. Medium duty applications include door frames.
   2. Two top coats and one coat primer.
   3. Top Coat(s): Interior Alkyd, Water Based; MPI #167, 168, or 169.
      a. Products:
         1) Sherwin-Williams ProMar 200 Waterbased Acrylic-Alkyd, Semi-Gloss.
         2) Or equal.
         3) Substitutions: Section 016000 - Product Requirements.
   4. Top Coat Sheen:
      a. Semi-Gloss: MPI gloss level 5; use this sheen at door frames.
   5. Primer: As recommended by top coat manufacturer for specific substrate.

C. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
   1. Shop primer by others.
   2. One top coat.
   3. Top Coat: Alkyd Dry Fall; MPI #55, 89, or 225.
      a. Products:
         1) PPG Paints Speedhide Alkyd Dry-Fog, 6-160XI, Flat. (MPI #55)
         2) Sherwin-Williams Dryfall Flat. (MPI #55)
         3) Or equal.
         4) Substitutions: Section 016000 - Product Requirements.
   4. Top Coat Sheen:
      a. Flat: MPI gloss level 1; use this sheen at all locations.
   5. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 **PRIMERS**

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Alkali Resistant Water Based Primer; MPI #3.
      a. Products:
         1) PPG Paints Perma-Crete Interior/Exterior Alkali Resistant Primer, 4-603 Series. (MPI #3)
         2) PPG Paints Seal Grip Acrylic Primer, 17-921 Series. (MPI #3)
         3) Or equal.

4) Substitutions: Section 016000 - Product Requirements.

2. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
   a. Products:
      1) PPG Paints Speedhide zero Interior Latex Sealer, 6-4900XI. (MPI #149)
      2) Substitutions: Section 016000 - Product Requirements.
3. Interior Drywall Primer Sealer.
   a. Products:
      1) PPG Paints Speedhide Interior Latex Sealer, 6-2.
      2) Or equal.
      3) Substitutions: Section 016000 - Product Requirements.
4. Interior/Exterior Quick Dry Alkyd Primer for Metal; MPI #76.
   a. Products:
      1) PPG Devguard Multi-Purpose Primer, 4160 Series. (MPI #76)
      2) Or equal.
      3) Substitutions: Section 016000 - Product Requirements.
5. Latex Primer for Interior Wood; MPI #39.
   a. Products:
      1) PPG Paints Seal Grip Acrylic Primer, 17-921 Series. (MPI #39)
      2) Or equal.
      3) Substitutions: Section 016000 - Product Requirements.
6. Bonding Primer, Water Based; MPI #17.
   a. Products:
      1) PPG Paints Seal Grip Acrylic Primer, 17-921 Series. (MPI #17)
      2) Or equal.
      3) Substitutions: Section 016000 - Product Requirements.

2.05 **ACCESSORY MATERIALS**

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 **PREPARATION**

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

F. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

G. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

H. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

I. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.

J. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.07 SCHEDULE - PAINT SYSTEMS

A. Gypsum Board: Finish surfaces exposed to view.

1. Interior Ceilings and Bulkheads: GI-OP-3L, flat.
2. Interior Walls: Eggshell.

B. Wood: Finish surfaces exposed to view.
1. Interior Doors: Eggshell.

C. Steel Doors and Frames: Finish surfaces exposed to view; semi-gloss.

D. Pipe and Duct Insulation Jackets: Finish surfaces exposed to view; FI-OP-2L, flat.

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SECTION 101400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

B. Emergency evacuation maps.

C. Building identification signs.

1.02 RELATED REQUIREMENTS

A. Section 265100 - Interior Lighting: Exit signs required by code.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Samples: Submit one sample of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

D. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.07 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs:
   1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
   2. Basis of Design: Cosco Industries (ADA signs); ADA Series 1: www.coscoarchitecturalsigns.com/#sle.
   3. Or equal.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Dimensional Letter Signs:
   1. A.R.K. Ramos Architectural Signage Systems; Fabricated Reverse Channel Metal Letters: www.arkramos.com/#sle.

2. Or equal.
3. Substitutions: See Section 016000 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every interior room located adjacent to the primary interior door serving the room, whether it has a door or not, not including corridors, lobbies, and similar open areas.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch (0.8 mm) and Grade II braille.
   3. Character Height: 1 inch (25 mm).
   4. Sign Height: 4 inches (101.6 mm), unless otherwise indicated.
   5. Office Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
   6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
   7. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
   8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

C. Emergency Evacuation Maps:
   1. Allow for one map per lobby.

D. Building Identification Signs:
   1. Use individual metal letters.
   2. Mount on outside wall in locations indicated on drawings.

2.03 SIGN TYPES

A. Flat Signs: Signage media without frame.
   1. Edges: Square.
   2. Corners: Square.
   3. Wall Mounting of One-Sided Signs: Tape adhesive.

B. Color and Font: Unless otherwise indicated:
   1. Character Font: Century Gothic.
   2. Character Case: Upper case only.
   3. Background Color: white.
   4. Character Color: black color.

2.04 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
   1. Total Thickness: 1/16 inch (1.6 mm).

DIMENSIONAL LETTERS

B. Metal Letters: Face of Building
   1. Metal: Aluminum sheet, fabricated reverse channel.
   2. Letter Thickness: 2 inch minimum (50.8 mm).
   3. Letter Height: As indicated on drawings.
   4. Text and Typeface:
      a. Character Font: Century Gothic.

b. Character Case: Upper case only.
5. Finish: painted. match architects sample.
6. Mounting: 1/2" standoff.

2.05 **ACCESSORIES**

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that substrate surfaces are ready to receive work.

3.02 **INSTALLATION**

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

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SECTION 102113.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Urinal and vestibule screens.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking and supports.

B. Section 102800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

B. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

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

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

D. Samples: Submit two samples of partition panels, 4 by 4 inch (101.6 by 101.6 mm) in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Toilet Compartments:
   1. Basis of Design: Accurate Partitions; https://accuratepartitions.com/.
   2. Or equal.
   3. Substitutions: Section 016000 - Product Requirements.

2.02 PLASTIC TOILET COMPARTMENTS

A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
   1. Color: Black 9205, ASI Standard Color Selection.
   2. Doors:
      a. Thickness: 1 inch (25 mm).
      b. Width: 24 inch (610 mm).
      c. Width for Handicapped Use: 36 inch (915 mm), out-swinging.
      d. Height: 55 inch (1397 mm).
   3. Panels:
      a. Thickness: 1 inch (25 mm).
      b. Height: 55 inch (1397 mm).
   4. Pilasters:
      a. Thickness: 1 inch (25 mm).

b. Width: As required to fit space; minimum 3 inch (76 mm).

5. Screens: Without doors; to match compartments; mounted to wall with two panel brackets.

2.03 **ACCESSORIES**

A. Pilaster Shoes: Stainless steel, satin finish, 3 inches (76 mm) high; concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Extruded aluminum, anti-grip profile.
   1. Size: Manufacturer's standard size.

C. Wall and Pilaster Brackets: Stainless steel; manufacturer's standard type for conditions indicated on drawings.

D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.

E. Hinges: Stainless steel, manufacturer's standard finish.
   1. Continuous-type hinge, self closing.

F. Door Hardware: Stainless steel, manufacturer's standard finish.
   1. Door Latch: Slide type with exterior emergency access feature.
   2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
   3. Provide door pull for outswinging doors.

G. Coat Hook with Rubber Bumper: One per compartment, mounted on door.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 **INSTALLATION**

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch (9 mm to 13 mm) space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 **TOLERANCES**

A. Maximum Variation From True Position: 1/4 inch (6 mm).

B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.04 **ADJUSTING**

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Under-lavatory pipe supply covers.

D. Diaper changing stations.

E. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 016000: Concealed supports for accessories.

B. Section 088300 - Mirrors: Other mirrors.

C. Section 093000 - Tiling: Ceramic washroom accessories.

D. Section 102113.19 - Plastic Toilet Compartments.

E. Section 224000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

D. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service 2015a.

E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

F. ASTM C1036 - Standard Specification for Flat Glass 2016.

G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.

H. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror 2018.

I. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping 2015.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

K. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use 2004, with Editorial Revision (2016).

L. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015.

M. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

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

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Commercial Toilet, Shower, and Bath Accessories:
   1. AJW Architectural Products: www.ajw.com/#sle.
   2. As indicated on drawings. Reference the Toilet Accessories Legend..
   3. Or equal.
   4. Substitutions: Section 016000 - Product Requirements.

B. Under-Lavatory Pipe Supply Covers:
   1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
   2. Or equal.
   3. Substitutions: Section 016000 - Product Requirements.

C. Diaper Changing Stations:
   1. Koala Kare Products: www.koalabear.com/#sle.
   2. As indicated on drawings. Reference the Toilet Accessories Legend..
   3. Or equal.
   4. Substitutions: 016000 - Product Requirements.

D. Provide products of each category type by single manufacturer.

2.02 **MATERIALS**

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

F. Adhesive: Two component epoxy type, waterproof.

G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 **FINISHES**

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 **COMMERCIAL TOILET ACCESSORIES**

A. Toilet Paper Dispenser: Double roll, surface mounted, for coreless type rolls.
   1. Products:
      a. As indicated on drawings. Reference the Toilet Accessories Legend..
      b. Or equal.
      c. Substitutions: Section 016000 - Product Requirements.

B. Combination Towel Dispenser/Waste Receptacle: Recessed with projecting waste receptacle, stainless steel; seamless wall flanges, continuous piano hinges.
   1. Products:
      a. As indicated on drawings. Reference the Toilet Accessories Legend..
      b. Or equal.

c. Substitutions: Section 016000 - Product Requirements.

C. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
1. Products:
a. As indicated on drawings. Reference the Toilet Accessories Legend..
b. Or equal.
c. Substitutions: Section 016000 - Product Requirements.

D. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick annealed float glass; ASTM C1036.
1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
2. Size: As indicated on drawings..
3. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.

E. Grab Bars: Stainless steel, smooth surface.
1. Standard Duty Grab Bars:
a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
b. Dimensions: 1-1/4 inch (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
c. Finish: Satin.
d. Length and Configuration: As indicated on drawings.
e. Products:
1) As indicated on drawings. Reference the Toilet Accessories Legend..
2) Or equal.
3) Substitutions: Section 016000 - Product Requirements.

F. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Products:
a. As indicated on drawings. Reference the Toilet Accessories Legend..
b. Or equal.
c. Substitutions: Section 016000 - Product Requirements.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Robe Hook: Heavy-duty stainless steel, double-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
1. Products:
a. As indicated on drawings. Reference the Toilet Accessories Legend..
b. Or equal.
c. Substitutions: Section 016000 - Product Requirements.

2.06 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
1. Insulate exposed drainage piping including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch (3.2 mm) flexible PVC.
a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
b. Comply with ASTM C1822, type indicated.
c. Comply with ASME A112.18.9.
d. Comply with ICC A117.1.

e. Microbial and Fungal Resistance: Comply with ASTM G21.
4. Color: White.
5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
6. Products:
   a. Plumberex Specialty Products, Inc; Plumberex Handy-Shield Maxx: www.plumberex.com/#sle.
   b. Or equal.
   c. Substitutions: Section 016000 - Product Requirements.

2.07 **DIAPER CHANGING STATIONS**

A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
   1. Material: Stainless steel.
   2. Mounting: Surface.
   3. Color: Satin stainless steel.
   4. Minimum Rated Load: 250 pounds (113.4 kg).
   5. Products:
      a. Koala Kare Products; Horizontal Stainless Steel Wall Mounted Baby Changing Station - Model KB110-SSWM: www.koalabear.com..
      b. Or equal.
      c. Substitutions: 016000 - Product Requirements.

2.08 **UTILITY ROOM ACCESSORIES**

A. Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, hat-shaped channel.
   1. Holders: Three spring-loaded rubber cam holders.
   2. Length: 36 inches (900 mm).
   3. Products:
      a. Builder Choice.
      b. Substitutions: Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.02 **PREPARATION**

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 **INSTALLATION**

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 **PROTECTION**

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 107316.13
METAL CANOPIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-engineered suspended shop fabricated metal canopies.

1.02 REFERENCE STANDARDS

A. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges 2016.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2014, with Editorial Revision (2017).

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

E. ASTM A992/A992M - Standard Specification for Structural Steel Shapes 2011 (Reapproved 2015).

F. ASTM E2950 - Standard Specification for Metal Canopy Systems 2014.

G. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs 2017.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015, with Errata (2016).

1.03 SUBMITTALS

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

B. Product Data: Submit product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.

C. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing profiles, sections of components, finishes, and fastening details.

D. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
   1. Comply with applicable code for submission of design calculations as required for acquiring permits.
   2. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.

B. Perform work in accordance with AISC 303.
   1. Maintain one copy on site.

C. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
   1. Not less than three years of documented experience.

D. Erector Qualifications: Company specializing in performing the work of this section.
   1. Not less than three years of documented experience and approved by canopy manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site ready for erection.
B. Package using methods that prevent damage during shipping and storage on site.
C. Store materials under cover and elevated above grade.

1.06 **WARRANTY**

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
B. Metal Canopies: Correct defective work within a one year period after Date of Substantial Completion.
C. Finish Warranty: Provide manufacturer's ten year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Metal Canopies:
   1. Parasol Awnings: www.parasolawnings.com.
   2. Or equal.
   3. Substitutions: See Section 016000 - Product Requirements.

2.02 **METAL CANOPIES**

A. Shop Fabricated Metal Canopy Type: Pre-Engineered Suspended Metal Canopy .
   1. Pre-engineered system complying with ASTM E2950.
   2. Design and fabricate metal canopy system to resist wind, snow, live, and seismic loads without failure, damage, or permanent deflection in accordance with ASCE 7:
   3. Thermal Movement: Design canopy system to accommodate thermal movement caused by ambient temperature range of 120 degrees F (49 degrees C) and surface temperature range of 180 degrees F (82 degrees C) without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects on assembly components.
B. Configuration: Hanger and bracket layout, canopy clearance, fascia profile, and roof covering design as indicated on drawings.

2.03 **SHOP FABRICATION**

A. Provide a complete system ready for erection at project site.
B. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.
C. Perform welding in accordance with AWS D1.1/D1.1M.
D. Fabricate connections for bolt, nut, and washer connectors.

2.04 **FINISHES**

A. Fascia: Polyester baked enamel finish; color as selected from manufacturer's standard range.

2.05 **ACCESSORIES**

A. Trim, Closure Pieces, and Flashings: Same material, thickness and finish as sheet metal decking; factory-fabricated to required profiles.
B. Fasteners, Non-Structural: ASTM F593 stainless steel or ASTM A307 carbon steel.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Examine substrates and site area for conditions that might prevent satisfactory installation.
B. Verify that foundation, electrical utilities, and placed anchors are in correct position.
C. Verify that bearing surfaces are ready to receive this work.
D. Verify that sufficient blocking has been installed within wall cavity to support canopy supports.
E. Do not proceed with installation until all conditions are satisfactory.

3.02 **INSTALLATION - CANOPY COVERING**

A. Install in accordance with manufacturer's instructions.

B. Fasten metal decking to steel support members, aligned level and plumb.

C. Install fascia panels, trim, and flashing.

D. Separate dissimilar metals using concealed bituminous paint.

E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.03 **TOLERANCES**

A. Maximum Variation from Level: Plus/Minus 1/8 inch (3.175 mm).

3.04 **CLEANING**

A. Clean surfaces of dust and debris; follow manufacturer's cleaning instructions for the finish used.

3.05 **PROTECTION**

A. Protect canopy after installation to prevent damage due to other work until Date of Substantial Completion.

END OF SECTION

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SECTION 123600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

1.02 RELATED REQUIREMENTS

A. Section 064100 - Architectural Wood Casework.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard 2016.

B. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use 2016.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards 2014, with Errata (2018).

E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1 2017, with Errata (2019).

F. ISFA 2-01 - Classification and Standards for Solid Surfacing Material 2013.

G. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material 2013.

H. MIA (DSDM) - Dimensional Stone Design Manual, Version VIII 2016.

I. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

J. PS 1 - Structural Plywood 2009.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Verification Samples: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Installation Instructions: Manufacturer's installation instructions and recommendations.

H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

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 **FIELD 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 **COUNTERTOPS**

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 1/2 inch (12 mm), minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) US Surfaces, Living Stone; Basis of design 1-866-433-2229
         2) Dupont; to match architect's sample: www.corian.com/#sle.
         3) Or equal.
         4) Substitutions: See Section 016000 - Product Requirements.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. NSF approved for food contact.
      d. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
      e. Color and Pattern: As indicated on drawings.
   3. Other Components Thickness: 1/2 inch (12 mm), minimum.
   4. Back and End Splashes: Same sheet material, square top; height as indicated on drawings.
   5. Skirts: As indicated on drawings.
   6. Fabricate in accordance with manufacturer's standard requirements.

2.02 **MATERIALS**

A. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf (20 kg/cu m) minimum density; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

B. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

D. Joint Sealant: Mildew-resistant silicone sealant, color to match adjoining material if available, otherwise use clear.

2.03 **FABRICATION**

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets as indicated on drawings. 1 inch (25 mm) except where top butts against cabinet or wall, unless otherwise indicated.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated where indicated on drawings.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.

2. Height: 4 inches (102 mm), unless otherwise indicated.

C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches (3657 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

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.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 **PREPARATION**

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 **INSTALLATION**

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.04 **TOLERANCES**

A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.

B. Offset From Wall, Countertops: 1/16 inch (1.5 mm) maximum

C. Field Joints: 1/16 inch (1.5 mm) wide, maximum.

3.05 **CLEANING**

A. Clean countertops surfaces thoroughly.

3.06 **PROTECTION**

A. Protect installed products until completion of project.

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

END OF SECTION

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SECTION 133419
METAL BUILDING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame.

B. Metal wall and roof panels including soffits and gutters and downspouts.

C. Exterior doors, windows, skylights, overhead doors, and louvers.

1.02 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications.

B. Section 079200 - Joint Sealants: Sealing joints between accessory components and wall system.

C. Section 081113 - Hollow Metal Doors and Frames.

D. Section 085113 - Aluminum Windows.

1.03 REFERENCE STANDARDS

A. AISC 360 - Specification for Structural Steel Buildings 2016.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2014 (Editorial 2017).

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2020.

F. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality 2014.

G. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process 2010 (Reapproved 2015).

H. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.

I. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures 2016.

J. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

K. ASTM C991 - Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings 2016.

L. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink) 2017.

M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

N. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions 2015a.

O. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.

P. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015, with Errata (2016).

Q. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems 2017.

R. MBMA (MBSM) - Metal Building Systems Manual 2012.

S. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

T. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

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

B. Product Data: Provide data on profiles, component dimensions, fasteners.

C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchors and methods of anchorage, and installation; framing anchor bolt settings, sizes, locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional engineering seal and signature.

D. Samples: Submit two samples of precoated metal panels for each color selected, 12 by 12 inch (304.8 by 304.8 mm) in size illustrating color and texture of finish.

E. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement.

F. Designer's Qualification Statement.

G. Manufacturer's Qualification Statement: Provide documentation showing metal building manufacturer is accredited under IAS AC472.
   1. Include statement that manufacturer designs and fabricates metal building system as integrated components and assemblies, including but not limited to primary structural members, secondary members, joints, roof, and wall cladding components specifically designed to support and transfer loads and properly assembled components form a complete or partial building shell.

H. Project Record Documents: Record actual locations of concealed components and utilities.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this type of work.
   1. Design Engineer Qualifications: Licensed in the State of Tennessee .
   2. Comply with applicable code for submission of design calculations as required for acquiring permits.
   3. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.

B. Perform work in accordance with AISC 360 and MBMA (MBSM).
   1. Maintain one copy on site.

C. Perform welding in accordance with AWS D1.1/D1.1M.

D. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
   1. Not less than ten years of documented experience.
   2. Accredited by IAS in accordance with IAS AC472.

E. Erector Qualifications: Company specializing in performing the work of this section with minimum 10 years documented experience.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide 40 year manufacturer warranty for precoated fluoropolymer panel film integrity and chalk and fade.
   1. Include coverage for exterior pre-finished surfaces to cover pre-finished color coat against chipping, cracking or crazing, blistering, peeling, chalking, or fading. Include coverage for weather tightness of building enclosure elements after installation.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Metal Buildings Systems:
   1. Metal Building Components Incorporated (MBCI); www.mbci.com
   2. Butler Manufacturing Company: www.butlermfg.com/#sle.
   3. Ceco Building Systems: www.cecobuildings.com/#sle.
   4. Kirby Building Systems: www.kirbybuildingsystems.com/#sle.
   5. VP Buildings: www.vp.com/#sle.
   6. Or equal.
   7. Substitutions: See Section 016000 - Product Requirements.

2.02 **ASSEMBLIES**

A. Single span rigid frame.

B. Bay Spacing: See plan drawing.

C. Primary Framing: Rigid frame of rafter beams and columns, canopy beams, and wind bracing.

D. Secondary Framing: Purlins, and other items detailed.

E. Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly, insulation, and liner sheets, and accessory components.

F. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly, insulation, and liner panels, and accessory components.

G. Roof Slope: 1 inches in 12 inches (1/12).

2.03 **PERFORMANCE REQUIREMENTS**

A. Installed Thermal Resistance of Wall System: R-value of R-19 vinyl-backed insulation (RSI-value of 3.35).

B. Installed Thermal Resistance of Roof System: R-value of R-13 vinyl-backed insulation with thermal blocks and R-13 full cavity insulation between purlins (RSI-value of 2.3).

C. Design structural members to withstand dead load, applicable snow load, and design loads due to pressure and suction of wind calculated in accordance with applicable code.

D. Design structural members to withstand IBC 2015 applicable loads indicated on structural drawings.

E. Design structural members to withstand Class 30 wind uplift in accordance with UL 580.

F. Exterior wall shall withstand imposed loads with maximum allowable deflection of 1/240 of span. Roof system with ceiling shall withstand imposed loads with maximum allowable deflection of 1/240 (D,S, or W), 1/180 (Lr) of span. Roof system with no ceiling shall withstand imposed loads with maximum allowable deflection of [1/180 (D,S, or W), 1/120 (Lr)] of span.

G. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 100 degrees F (37 degrees C) within a 24 hour period.

H. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

2.04 **MATERIALS - FRAMING**

A. Structural Steel Members: ASTM A992.

B. Structural Tubing: ASTM A500/A500M Grade B cold-formed.

C. Plate or Bar Stock: ASTM A529/A529M, Grade 50.

D. Anchor Bolts: ASTM F1554 GR 36 or 55 as indicated, Grade A, with no preference for protective coatings.

E. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1; galvanized to ASTM A153/A153M.

F. Welding Materials: Type required for materials being welded.

G. Primer: SSPC-Paint 20 zinc rich.

H. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch (13.7 MPa).
   2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch (48 MPa).
   3. Height Change, Plastic State: When tested in accordance with ASTM C827/C827M:
      a. Maximum: Plus 4 percent.
      b. Minimum: Plus 1 percent.

2.05 **MATERIALS - WALLS AND ROOF**

A. Steel Sheet: ASTM A792/A792M aluminum-zinc alloy coated to AZ50/AZM150.

B. Insulation: ASTM C991 Type II;.
   1. Facing: Vinyl-faced, R-13 thick (walls), white.
   2. Facing: Vinyl-faced, R-13 thick (roof) with thermal blocks + R-13 (thick) unfaced (roof) between purlins

C. Joint Seal Gaskets: Manufacturer's standard type.

D. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A153/A153M, finish to match adjacent surfaces when exterior exposed.

E. Sealant: ASTM C920, elastomeric sealant with movement capability of at least plus/minus 50 percent; 100 percent silicone; for exposed applications, match adjacent colors as closely as possible.

F. Trim, Closure Pieces, Caps, Flashings, Gutters, Downspouts, Fascias: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
   1. Basis of Design:
      a. Rake Trim: MBCI box rake trim T-5238 or equal
      b. Peak Trim: MBCI peak trim T-5080 or equal
      c. Roof Gutter: MBCI metal box gutter T-5271 or equal
      d. Gutter Downspouts: MBCI 4"x4" metal downspout with 45 degree kickout T-5325 or equal
      e. Outside and Inside Corner Trim: MBCI Outside Corner (T-5241) and Inside Corner (T-5251) trim or equal
      f. Base Trim: MBCI MasterLine 16 base trim or equal
      g. All other trims as indicated within the drawings to be of equal gauge, finish, and color as standard MBCI Architectural Trim.

2.06 **COMPONENTS**

A. Doors and Frames: Specified in Section 081113.

B. Windows: Specified in Section 085200.

2.07 **FABRICATION - FRAMING**

A. Fabricate members in accordance with AISC 360 for plate, bar, tube, or rolled structural shapes.

B. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.

C. Provide wall opening framing for doors, windows, and other accessory components.

2.08 **FABRICATION - WALL AND ROOF PANELS**

A. Siding: Minimum 26 gauge metal thickness, corrugated profile indicated, 7/8 inch (22 mm) deep, lapped edges fitted with continuous gaskets.

1. Basis of Design:

a. Metal Building Components Incorporated (MBCI); PBC Wall Panel; www.mbci.com

b. Or equal.

B. Roofing: Minimum 22 gauge metal thickness, field-seamed double-lock trapezoidal leg standing seam profile, lapped edges.

1. Basis of Design:

a. Metal Building Components Incorporated (MBCI); Double-Lok Roof Panel; www.mbci.com

b. Or equal.

C. Soffit Panels: Minimum 24 gauge metal thickness, flush face profile indicated, unperforated.

1. Basis of Design:

a. Metal Building Components Incorporated (MBCI); Artisan Soffit Panel; www.mbci.com

b. Or equal.

D. Girts/Purlins: Rolled formed structural shape to receive siding, roofing and liner sheet.

E. Flashings, Closure Pieces, Fascia: Same material and finish as adjacent material, profile formed as detailed.

F. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

2.09 **FABRICATION - GUTTERS AND DOWNSPOUTS**

A. Fabricate of same material and finish as wall panel metal.

B. Form gutters and downspouts of square or rectangular profile and size indicated to collect and remove water. Fabricate with connection pieces.

C. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.

D. Fabricate support straps of same material and finish as wall metal, color as selected.

2.10 **FINISHES**

A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.

B. Exterior Surfaces of Wall Components and Accessories: Precoated enamel on steel of 70% fluoropolymer (Kynar 500) finish, color as selected from manufacturer's standard range.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.02 **ERECTION - FRAMING**

A. Erect framing in accordance with AISC 360.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 **ERECTION - WALL AND ROOF PANELS**

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Locate end laps over supports. End laps minimum 2 inches (50 mm). Place side laps over bearing.

E. Provide expansion joints where indicated.

F. Use concealed fasteners on the roof and exposed fasteners on the walls.

G. Install insulation utilizing purlin for attachment.

H. Install sealant and gaskets, providing weather tight installation.

3.04 **ERECTION - GUTTERS AND DOWNSPOUTS**

A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

B. Apply bituminous paint on surfaces in contact with cementitious materials.

C. Slope gutters minimum 1/2 inch per 10 feet.

D. Install splash pads under each downspout.

3.05 **INSTALLATION - ACCESSORY COMPONENTS IN WALL SYSTEM**

A. Install door frames, doors, and windows and glass in accordance with manufacturer's instructions.

3.06 **TOLERANCES**

A. Framing Members: 1/4 inch (6 mm) from level; 1/8 inch (3 mm) from plumb.

B. Siding and Roofing: 1/8 inch (3 mm) from true position.

END OF SECTION

SECTION 23 01 30.51 - HVAC AIR DUCT CLEANING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cleaning of HVAC duct system, equipment, and related components.

1.2 RELATED REQUIREMENTS

A. Division 01: Quality Requirements: Additional requirements for testing and inspection agencies.

1.3 DEFINITIONS

A. HVAC System: For purposes of this section, the surfaces to be cleaned include all interior surfaces of the heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system, including the inside of air distribution equipment, diffusers, grilles, registers, coils, and condensate drain pans; see NADCA ACR for more details.

1.4 REFERENCE STANDARDS

A. NADCA ACR - Assessment, Cleaning and Restoration of HVAC Systems; 2014.

B. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

C. UL 181A - Closure Systems for Use with Rigid Air Ducts; Current Edition, Including All Revisions.

1.5 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.

C. Material Safety Data Sheets (MSDS): For all chemical products proposed to be used in the cleaning process; submit directly to Owner.

D. Project Closeout Report: Include field quality control reports, evidence of satisfactory cleaning, and documentation of items needing further repair.

1.6 QUALITY ASSURANCE

A. Information Available to Contractor: Upon request, Owner will provide the following:
   1. One copy of original construction drawings of HVAC system.

B. Cleaning Contractor Qualifications: Company specializing in the cleaning and restoration of HVAC systems as specified in this section.
   1. Certified by one of the following:
      a. NADCA, National Air Duct Cleaners Association: www.nadca.com
   2. Having minimum of three years documented experience.

3. Employing for this project a supervisor certified as an Air Systems Cleaning Specialist by NADCA.

PART 2 PRODUCTS

2.1 TOOLS AND EQUIPMENT

A. Vacuum Devices and Other Tools: Exceptionally clean, in good working order, and sealed when brought into the facility.

B. Vacuum Devices That Exhaust Air Inside Building, Including Hand-Held and Wet Vacuums: Equipped with HEPA filtration with 99.97 percent collection efficiency for minimum 0.3-micron size particles and DOP test number.

C. Vacuum Devices That Exhaust Air Outside Building, Including Truck- and Trailer-Mounted Types: Equipped with particulate collection including adequate filtration to contain debris removed from the HVAC system; exhausted in manner that prevents contaminant re-entry to building; compliant with applicable regulations as to outdoor environmental contamination.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Comply with applicable federal, state, and local requirements.

B. Perform cleaning, inspection, and remediation in accordance with the recommendations of NADCA "Assessment, Cleaning and Restoration of HVAC Systems" (ACR) and as specified herein.

C. Where NADCA ACR uses the terms "recommended", "highly recommended", or "ideally" in regard to a certain procedure or activity, do that unless it is clearly inapplicable to the project.

D. Follow Owner's Infection Control Risk Assessment (ICRA) Plan.

E. Obtain Owner's approval of proposed temporary locations for large equipment.

F. Designate a decontamination area and obtain Owner's approval.

G. If unforeseen mold or other biological contamination is encountered, notify Architect immediately, identifying areas affected and extent and type of contamination.

3.2 PREPARATION

A. When cleaning work might adversely affect life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with authorities having jurisdiction.

B. Ensure that electrical components that might be adversely affected by cleaning are de-energized, locked out, and protected prior to beginning work.

C. Air-Volume Control Devices: Mark the original position of dampers and other air-directional mechanical devices inside the HVAC system prior to starting cleaning. Coordinate pre-balance readings with test and balance contractor as applicable.

D. Access to Concealed Spaces: Use existing service openings and make additional service openings as required to accomplish cleaning and inspection.
   1. Do not cut openings in non-HVAC components without obtaining the prior approval of Owner.
   2. Make new openings in HVAC components in accordance with NADCA Standard 05; do not compromise the structural integrity of the system.
   3. Do not cut service openings into flexible duct; disconnect at ends for cleaning and inspection.

E. Ceiling Tile: Lay-in ceiling tile may be removed to gain access to HVAC systems during the cleaning process; protect tile from damage and reinstall upon completion; replace damaged tile.

3.3 CLEANING

A. Use any cleaning method recommended by NADCA ACR unless otherwise specified; do not use methods prohibited by NADCA ACR, or that will damage HVAC components or other work, or that will significantly alter the integrity of the system.

B. Obtain Owner's approval before using wet cleaning methods; ensure that drainage is adequate before beginning.

C. Ducts: Mechanically clean all portions of ducts.

D. Hoses, Cables, and Extension Rods: Clean using suitable sanitary damp wipes at the time they are being removed or withdrawn from their normal position.

E. Registers, Diffusers, and Grilles: When removing, take care to prevent containment exposure due to accumulated debris.

F. Coils: Follow NADCA ACR completely including measuring static pressure drop before and after cleaning; do not remove coils from system to clean; report coils that are permanently impacted.

G. Collect debris removed during cleaning; ensure that debris is not dispersed outside the HVAC system during the cleaning process.

H. Store contaminated tools and equipment in polyethylene bags until cleaned in the designated decontamination area.

3.4 REPAIR

A. Repair openings cut in the ventilation system so that they do not significantly alter the airflow or adversely impact the facility's indoor air quality.

B. At insulated ducts and components, accomplish repairs in such a manner as to achieve the equivalent thermal value.

C. Reseal new openings in accordance with NADCA Standard 05.

D. Reseal rigid fiber glass duct systems using closure techniques that comply with UL 181 or UL 181A.

E. When new openings are intended to be capable of being re-opened in the future, clearly mark them and report their locations to Owner in project report documents.

3.5 FIELD QUALITY CONTROL

A. Ensure that the following field quality control activities are completed prior to application of any treatments or coatings and prior to returning HVAC system to normal operation.

B. Visually inspect all portions of the cleaned components; if not visibly clean as defined in NADCA ACR, re-clean and reinspect.

C. Coils: Cleaning must restore the coil pressure drop to within 10 percent of the coil's original installed pressure drop; if original pressure drop is not known, coil will be considered clean if free of foreign matter and chemical residue based on visual inspection.

D. Notify Architect when cleaned components are ready for inspection.

E. When directed, re-clean components until they pass.

F. Submit evidence that all portions of the system required to be cleaned have been cleaned satisfactorily.

3.6 ADJUSTING

A. After satisfactory completion of field quality control activities, restore adjustable devices to original settings, including, but not limited to, dampers, air directional devices, valves, fuses, and circuit breakers.

B. Coordinate testing and re-balancing of existing systems with test and balance contractor.

3.7 WASTE MANAGEMENT

A. Double-bag all waste and debris in polyethylene bags.

B. Dispose of debris off-site in accordance with applicable federal, state and local requirements.

END OF SECTION 23 01 30.51

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Common work results for requirements specifically applicable to Division 23.

B. Requirements of Division 01 Specifications, General Provisions of the Contract and General and Supplementary Conditions apply to this Division.

1.2 REGULATORY REQUIREMENTS

A. Perform Work specified in Division 23 in accordance with standards listed below of the latest applicable edition adopted by the authority having jurisdiction. Where these Specifications are more stringent, they shall take precedence. In case of conflict, obtain a decision from the Architect.
1. NFPA 30: Flammable and Combustible Liquids Code
2. NFPA 54: National Fuel Gas Code
3. NFPA 70: National Electrical Code
4. NFPA 72: National Fire Alarm and Signaling Code
5. NFPA 90A: Standard for the Installation of Air Conditioning and Ventilating Systems
6. NFPA 90B: Standard for the Installation of Warm Air Heating and Air Conditioning Systems
7. NFPA 92A: Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences
8. NFPA 96: Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
9. NFPA 101: Life Safety Code
10. NFPA 101A: Guide on Alternative Approaches to Life Safety
11. NFPA 101B: Standard on Means of Egress for Buildings and Structures
12. NFPA 105: Standard for the Installation of Smoke Control Door Assemblies and Other Opening Protectives
13. NFPA 241: Standard for Safeguarding Building Construction, Alterations, and Demolition Operations
14. NFPA 5000: Building Construction and Safety Code
15. ANSI A17.1: Elevators, Dumbwaiters, Escalators and Moving Walks
16. ANSI Handicapped Code-A117.1
17. ASTM E814-08B: Standard Test Method for Fire Tests Penetration Firestop Systems.
18. U.L. Fire Resistance Index.
19. All applicable Occupational Safety and Health Administration (OSHA) Publications, Rules and Regulations.
20. Americans with Disabilities Act (ADA)
21. Special regulations, supplement, and amendments of the State and/or local authorities having jurisdiction.

1.3 REFERENCE STANDARDS

A. AGA: American Gas Association.

B. ANSI: American National Standards Institute.

C. ARI: American Refrigeration Institute.

D. ASHRAE: American Society of Heating Refrigeration and Air Conditioning Engineers.

E. ASME: American Society for Mechanical Engineers.

F. ASTM: American Society for Testing and Materials.

G. AWWA: American Water Works Association.

H. FM: Factory Mutual

I. IRI: Industrial Risk Insurers

J. MSS: Manufacturer's Standardization Society of the Valve and Fitting Industry.

K. NEMA: National Electrical Manufacturers' Association.

L. NFPA: National Fire Protection Association.

M. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

N. UL: Underwriters' Laboratories, Inc.

O. U.L. Fire Resistance Index

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Incomplete submittals containing unmarked cutsheets or not providing specific detail of what is being proposed will be rejected and will not be reviewed.

C. Include Products as specified in the individual sections of Division 23.

D. Submit shop drawing and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

E. Prepare shop drawings completely independent of the Engineer of Record's CADD files or Revit model. Should the Contractor or Vendor wish to use the Engineer of Record's CADD files or Revit model as the basis for developing their shop drawings, a release form, obtainable from the Engineer or Architect, must be signed. A nominal charge of $50.00 per sheet must be made payable to the engineering firm to cover the cost of preparing the drawings for use by others.

F. Submit copies of shop drawings in accordance with Division 01, including:
   1. Building Automation System including direct digital control drawings.
   2. Concrete pads and foundations including anchor bolt and sleeve locations.
   3. Prepare and submit coordination drawings as specified herein. Facilitate the coordination effort with all other trades, specifically Divisions 21, 22, 26 and 28 and shall include:
      a. Central Plant
      b. Boiler Room
      c. Chiller Room

d. Electric Switchgear Rooms
e. Arena Bowl Mechanical Rooms
f. Mechanical Rooms
g. Fire Pump Room
h. Coordinated room layouts shall include:
   1) Room dimensions.
   2) Support column locations.
   3) Locations and dimensions of equipment foundations and pads required.
   4) Locations and dimension of equipment and apparatus, including electrical control panels and starters, and service and coil pull areas.
   5) Dimensioned floor drain locations.
   6) Locations of wall mounted equipment.
   7) Trench locations and sizes.
   8) Sleeve locations in mechanical rooms and equipment rooms.
   9) AHU (fan) and duct layouts in AHU equipment rooms.
   10) Piping 3" and larger.
   11) Conduit 3" and larger.

4. Roof layouts including:
   a. Air Intakes.
   b. Vents.
   c. Boiler Stacks.
   d. Vacuum Pump discharge.
   e. Clinical Air Compressor Intake.
   f. Exposed ductwork.
   g. Roof mounted equipment.

G. Brochures: Submit manufacturer's product data and brochures including:
   1. Complete descriptions.
   2. Illustrations.
   3. Rating data, accessories, dimensional data, and applicable options and features marked for the specific items scheduled on drawings and specified herein.
   4. Capacities stated in the terms specified.
   5. Performance curves for all air handling units, fans, and pumps.

1.5 FIELD CONDITIONS

A. Layouts indicated on drawings are diagrammatic and intended to show relative positions and arrangement of equipment, ductwork and piping. Coordinate mechanical work with other trades and measurements obtained at the job site, as applicable, prior to installation. Generally, install work in locations shown on Drawings, using as necessary rises, drops, offsets, transitions, and alternate routings to fit in the available space unless prevented by Project conditions.

B. If prevented by project conditions, prepare drawings showing proposed rearrangement of Work, including changes to Work specified in other sections. Obtain permission of Architect before proceeding.

C. Place anchors, sleeves, and supports prior to pouring concrete or installation of masonry work.

D. 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.

E. Determine sizes and verify locations of existing utilities on or near site.

F. Keep roads clear of materials and debris.

G. Visit site and be informed of conditions under which Work must be performed.

H. Locate equipment requiring periodic servicing so that it is readily accessible. Provide means of service access, following appropriate manufacturer's recommended service clearance space or, as applicable, means of access using duct, wall, or ceiling access doors.

I. Install ductwork and piping to leave sufficient space for AHJ inspection of wall construction.

1.6 FEES AND PERMITS

A. Obtain and pay for all necessary permits and inspection fees required to perform Division 23 work.

1.7 COORDINATION DRAWINGS

A. Prior to commencement of installation, prepare coordination drawings for work under this division, as specified in Division 01, in full cooperation with persons performing work under other Divisions, including but not limited to mechanical, electrical, plumbing, fire protection, telecommunications, audio/visual and miscellaneous steel.

B. Drawings shall not be formally submitted but shall be kept on site for reference. Notify Architect and Construction Manager of conflicts that cannot be resolved.

C. Coordination Drawings shall be prepared to include the following:
1. Drawn to a scale of 1/4" = 1'-0".
2. Room dimensions.
3. Sheet size matching contract documents.
4. Duct sizes with bottom elevation from finished floor.
5. Show equipment, columns, and beams.
6. Duct fitting details.
7. Construction details of plenums and casings.
8. Concrete pad and foundation layouts including anchor bolt and sleeve locations.
9. Dimensioned floor drain locations.
10. Wall mounted equipment.
11. Piping 3" and larger, with elevations from finished floor to bottom of pipe.
12. Space allocation for conduits and cable trays.
13. Ceiling height.
14. Ductwork, air terminal units, and piping 3" and larger shall be shown in proper graphic scale.
15. Clearance requirements for control panels, inspections, and maintenance.
16. Coordination drawings are to indicate air terminal units, fan coil units, air handling units, control panels, and all other devices and materials to proper scale.

1.8 COMPLETENESS OF WORK

A. The Contract Documents depict HVAC systems which are intended to be complete and functioning systems. All products, materials, and labor necessary to render a fully functional system to fulfill the design intent shown on the documents shall be provided by the Contractor.

B. Catalog numbers referenced throughout the Division 23 Drawings and Specifications are intended to convey a general understanding of the type and quality of the product required. Where written descriptions differ from information conveyed by a catalog number, the written description shall govern. No extra shall be allowed because a catalog number is found to be incomplete or obsolete.

1.9 PRODUCT SUBSTITUTIONS

A. Comply with provisions of Division 01.

1.10 RECORD DRAWINGS

A. Provide record drawings that illustrate the work of Division 23 as finally constructed. Deliver record drawings to the Architect in a form suitable for reproduction.

B. Provide record drawings that illustrate the work of Division 23 as finally constructed. Deliver record drawings to the Architect electronic format and also three (3) copies marked in red ink to reflect work as constructed.

C. Record drawings shall reflect all changes made to the Contract Documents, whether generated by addenda, change orders, or field conditions. Maintain a daily record of these changes and keep current set of drawings showing these changes.

D. Deliver record drawings to Architect within 30 days of Substantial Completion.

E. Record drawings are to indicate air terminal units, fan coil units, air handling units, fans, control panels, and all other devices and materials to proper scale.

1.11 OWNING AND OPERATING MANUALS

A. Manuals shall include clear and comprehensive instructions with appropriate graphics and project specific marked data to enable owner to operate and maintain all systems specified in this Division.

B. Copies of final reviewed submittals indicating all model numbers, serial numbers, cut sheets, and all performance criteria on furnished equipment shall be included.

PART 2 - PRODUCTS

2.1 EQUIPMENT SUPPORTS

A. Structural Steel for Supports: ASTM A36.
   1. Use galvanized members installed in fan plenums or areas of high humidity or condensation, and outside. All fasteners shall be stainless steel. Any damage caused by cutting, drilling, or welding or any other means to galvanized surface must be repaired by apply two coats of cold-galvanizing.
   2. Use hot dipped galvanized members installed in fan plenums or areas of high humidity or condensation, in tunnels and outside. All fasteners shall be stainless steel. Any damage caused by cutting, drilling, or welding or any other means to galvanized surface must be repaired by applying two coats of cold-galvanizing.
   3. Furnish other members with shop coat of primer.
   4. Retouch primer after field welding.

2.2 FLASHINGS AND COUNTERFLASHINGS

A. Furnish materials and coordinate installation for flashing and counterflashing roof penetrations for ductwork and piping.

B. Materials:
   1. Sheetmetal: 24 gauge minimum ASTM A525, Class G90.
   2. Sheet lead: 3 pounds per square foot.
   3. Stainless steel: Minimum 20 gauge.
   4. Sheet copper: 24 OZ/SF.

2.3 WALL AND CEILING ACCESS PANELS

A. Style and type as required for material in which installed.

B. Size: 24"x24" minimum, as indicated, or as required to allow inspection, service and removal of items served.

C. 14 gauge minimum sheet metal for doors, 16 gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction.

D. Panels shall have spring hinges with screwdriver locks in non-public areas. Key lock, keyed alike, for panels in public areas.

E. Prime painted or rust inhibitive paint finish.

F. UL labeled when in fire-rated construction, 1-1/2 hour rating.

G. Provide in walls, floors, and ceilings to permit access to all equipment and piping requiring service or adjustment. Examples of such equipment needing access are fire and/or smoke dampers, mechanical system valves, and equipment needing periodic or replacement maintenance.

H. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.

I. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers, or approved equal.
   1. For masonry and drywall construction: Milcor Style M.
   2. For plastered masonry walls and ceiling: Milcor Style K.
   3. For ceramic tile or glazed structural tile: Use stainless steel panels.

2.4 PIPE ENCLOSURES

A. For exposed vertical piping in kitchen: 18 gauge stainless steel (Type 302) with No. 4 finish.
   1. Extend from 2" above ceiling to equipment or island partition.
   2. Size covers to contain number of pipes served.

B. Minimize number of covers by enclosing maximum number of pipes in each drop.

C. Anchor to equipment or partition.

D. Fasten seams and joints with stainless steel pop rivets.

E. Provide 1-1/2" ceiling flange as closure.

2.5 SLEEVES

A. Materials:
   1. Concrete floors, concrete and masonry walls: 18 gauge galvanized steel tube with welded longitudinal seam or Schedule 10 galvanized steel pipe.
   2. Drywall partitions: 18 gauge galvanized steel sheetmetal or Schedule 10 galvanized steel pipe.

B. Sleeves shall be sized such that the annular space between outside surface of pipe or pipe insulation and the inside surface of the sleeve is not less than 1/2". Provide larger annular space if required by firestopping product installation instructions or water proofing seal in exterior wall penetration.

C. Sleeves supporting riser piping 4" and larger shall have three 6" long reinforcing rods welded radially at 120 degree spacing to the sleeve and shall be installed with the rods embedded in the concrete slab as the floor slabs are poured.

D. Exterior wall and floor penetrations shall be sleeved and sealed with a Link Seal Modular Seal by GPT Industries or Flexicraft Industries.
   1. Exterior wall and floor penetrations: Install Link Seal Modular Seal by GPT or Flexicraft Industries. Seal shall be suitable for use in direct ground contact, water or atmospheric conditions with EPDM seal element. Provide Nitrile rubber seal element where subject to oils and fuel. All bolts, nuts and fasteners shall be Steel with 2-part Dichromate corrosion inhibiting coating or Type 316 Stainless steel.

2.6 ESCUTCHEON PLATES

A. Provide B & C No. 10 or equal chrome plated escutcheon plates where pipes penetrate partitions or ceilings in finished areas.

PART 3 - EXECUTION

3.1 EXCAVATING AND BACKFILLING

A. Contractor shall review Division 31 and 33 and shall perform excavation and backfilling in accordance with the most stringent requirements. Contractor shall request clarification before proceeding if there are conflicting instructions.

B. Contract Documents show the approximate location of underground utilities known to exist in the area of construction. Contractor shall determine the exact location of utilities.
   1. Locate and uncover existing utilities which require new connections before trenching in the vicinity of indicated utility connection.
   2. Clear all vegetation and other objectionable material from the area required for the excavation and backfill operations. Disposal of material removed by the clearing operation shall be approved by the Owner's Representative.

C. Provide trenching, excavating, and backfilling necessary for performance of work indicated in Contract Documents.

D. Excavate to depths indicated on the drawings or as necessary to permit the installation of pipe, bedding, backfill, structures or appurtenances. Provide a firm, undisturbed, uniform surface in the bottom of trenches. Where excavation exceeds the required depth, bring the excavation to proper grade through the use of an approved incompressible backfill material. Store excavated material and dispose of surplus excavated material.
   1. Excavate trench to sufficient depth to permit a minimum of 36" of cover over the top of the pipe unless otherwise required by pipe elevations indicated on the Drawings. The trench width shall be 18" plus the diameter of the pipe and/or the largest bell.

E. Trenching and excavation shall be unclassified. No extra will be paid in the event that rock is encountered.
   1. Should rock excavation be required, use only experienced personnel for blasting.
   2. Exercise extreme care when blasting with signals of danger given before firing any charge.
   3. Conform to and obey all public authority regulations for the protection of life and property.

F. Provide sheathing, shoring, dewatering, and cleaning necessary to keep trenches an their grades in proper condition and to meet applicable codes.

G. Provide a minimum of 6" of No. 67 crushed stone or clean sand bedding, or equal, in the bottom of the trench to maintain the required grade and continuous support of the bottom quadrant of the pipe. On bell and spigot piping, dig bell holes so bottom of bells do not support pipe.

H. Upon completion of excavation, and prior to the laying of the pipe, the trench bottom shall be brought up to the required elevation with min. 6" pipe bedding. Pipe bedding shall be select material deposited in the trench, and shall be compacted, leveled off, and shaped to obtain a smooth compacted bed along the laying length of the pipe. Material for pipe bedding shall comply with local codes. In absence of local code requirements the bedding shall be bank sand or select back fill material approved by the Architect. Any material used shall pass a 1/4 inch screen.

I. Clean and inspect pipe for defects before lowering into trench for assembly. Install pipe in accordance with provisions of Contract Documents and with the recommendations of the pipe manufacturer.
   1. Ensure pipe is of proper strength and classification for specified service. Discard damaged or defective pipe discovered during pipe laying operations.
   2. Maintain alignment and grade during layout operation. Use acceptable method for maintaining grade and alignment to produce desired results.

J. Where crushed stone backfill is required, use No. 67 stone, clean sand or equal.

K. After bedding has been shaped and the pipe assembled, place crushed stone carefully around the pipe and to a point 12" above the pipe. Backfill above this point shall be as described below:
   1. Backfill areas of vehicular traffic shall consist entirely of crushed stone and compacted crusher run material.
   2. Backfill for shoulders of roadways, sidewalk, and slab on grade structures shall consist entirely of crushed stone.
   3. Backfill areas not subject to vehicular traffic may consist of suitable excavated material as described above.

L. Where crushed stone is not required, suitable excavated material may be utilized. This includes fine, dry earth or a mixture of earth and shot rock. Rocks larger than 6" in any dimension may not be included in any portion of the backfill material.

M. Trenches shall be backfilled only after piping has been inspected, tested, and approved by the Architect. All backfill material shall be placed in the trench either by hand or by approved mechanical methods. The compaction of backfill material shall be accompanied by tamping, with hand tools or approved pneumatic tampers, by using vibratory compactors, by puddling, or by any combination of the three. The method of compaction shall be approved and all compaction shall be done to the satisfaction of the Architect. Backfill completely around pipe, including 18" above the pipe, with suitable bank sand, tamped in 4" layers under, around, and over pipe. Water down backfill as required. The remainder of the backfill shall be select backfill material tamped at intervals of no more than 12" depths. All materials to be used as selected material backfill shall be approved by the Architect. If, in the opinion of the Architect, the excavated material does not meet the requirements of selected material, the Contractor shall be required to screen the material prior to its use as selected material backfill. Material used in the upper portion of the backfill or subgrade shall not contain stone, rock, or other material larger than six inches in its longest dimension. No wood, vegetable matter, or other material which, in the opinion of the Architect, is unsuitable shall be included in the backfill. The upper 24" of backfill may be water jetted, if desired. Backfill shall be brought up to finish grade identified on the Architectural Drawings, including additional backfill required to offset settlement during consolidation.

3.2 CUTTING AND PATCHING

A. Repair or replace damage caused by cutting or installation of work specified in Division 23.

B. Perform repairs with materials which match existing and install in accordance with the appropriate section of these specifications.

3.3 FLASHING AND COUNTERFLASHING

A. Counterflash ducts and pipes where penetration of roofs and outside walls occur.

3.4 CONNECTION TO EQUIPMENT FURNISHED BY OWNER

A. Connect and/or install equipment shown on mechanical drawings that requires mechanical connections.

B. Provide piping, isolation valves, unions, and other piping appurtenances required for a complete installation.

C. Provide steam strainers, steam traps, and pressure reducing valves in steam lines.

3.5 DELIVERY, STORAGE, AND PROTECTION

A. Insofar as possible, deliver items in manufacturer's original unopened packaging. Where deliver in original packaging is not practical, provide cover and shielding for all items with protective materials to keep them from being damaged. Use care in loading, transporting, unloading, and storing to keep items from being damaged.

B. Store items in a clean, dry place, and protect from damage. Mechanical equipment may not be staged or stored outdoors unless intended for outdoor use.

C. Protect nameplates on motors, pumps, and similar equipment. Do not paint or insulate over nameplate data.

D. Protect valves and piping from damage. Cover equipment during work of finishing trades.

E. Keep dirt and debris out of pipes and ducts.

F. Repair, restore, and replace damaged items.

G. Cover factory finished equipment during work of finished trades, such as fan coils, fin tubes, etc.

H. Protect cooling and/or heating coils with temporary filter media during construction.

3.6 SLEEVES

A. Floors and Roof slabs: Sleeve all pipe penetrations including mechanical equipment rooms and other wet areas. Extend sleeve 2" above finished floor and roof, except piping within pipe chases. Sleeve shall be flush with underside of floor.

B. Masonry or concrete walls: Sleeve all pipe penetrations. Sleeves shall be flush on both sides of wall.

C. Non-Rated Drywall partitions: Sleeves are not required, except in systems above 160 degrees F. Voids between pipe, pipe insulation and drywall shall be sealed with appropriate joint sealant material.

D. Seal voids between outside surface of sleeve and wall, partition or floor. Seals shall be airtight.

E. For all fire rated walls, floors and partitions install piping, insulation and sleeves in strict accordance with applicable U.L. floor or partition assembly instructions. Coordinate installation and fire stop material with Division 07 and Firestop Manufacturer's installation instructions.

F. Clearance between sleeve and pipe: Minimum of 1/2 inch for hot piping and 1 inch for cold piping or as otherwise dictated by U.L. Fire Resistance Directory.

G. Wall Penetrations not Sleeved or Firestopped:
   1. Seal voids between pipe and partition with appropriate joint sealant material. Seals shall be airtight.

H. Core drilled holes in concrete floors: Sleeves are not required. Seal airtight and to maintain the floor rating integrity.

3.7 ESCUTCHEON PLATES

A. Provide chromium plated escutcheon plates for exposed uninsulated pipes projecting through floors or walls in "finished" spaces. Mechanical rooms, store rooms, electric closets, and janitor closets are not considered "finished" spaces.

3.8 EQUIPMENT GUARDS

A. Use suitable structural frames with minimum 12 gauge, 3/4" galvanized mesh, or expanded metal mesh. Attach to equipment by removable clips and bolts with wing nuts, or other approved connectors.

B. At belts, provide opening for measuring RPM.

C. Provide at all belts, couplings, moving machinery and equipment.

D. Design for easy access to belts and other items requiring replacement.

E. Comply with OSHA Regulations.

3.9 CLEANING HVAC SYSTEMS

A. General Cleanup:
   1. Upon completion of contract and progressively as work proceeds, clean up dirt, debris, old materials, etc., and remove from site, keeping premises in neat and clean condition to satisfaction of the Architect. See Division 01 of specifications for further requirements.
   2. Seepage, discoloration or other damage to parts of the building, its finish, or furnishings due to Contractor's failure to properly clean piping systems or duct systems shall be repaired without cost to the Owner.

B. Factory Finishes:
   1. Clean items with factory finishes. Touch up bare places, scratches and other minor damage to finishes. Use only factory supplied paint of matching color and formula. If finishes are badly damaged or if there are many damaged, scratched or bare places, refinish the entire item.

C. Ducts and Apparatus:
   1. Thoroughly clean ducts and apparatus casings before fans and filters are operated.

D. HVAC Closed and Open Water Systems:
   1. Initial flushing:
      a. Remove loose dirt, mill scale, metal chips, weld beads, rust, and like deleterious substances without damage to any system components.
      b. Bypass factory equipment unless acceptable means of protection are provided, or by subsequent inspection of water boxes and other "hide-out" areas takes place.
      c. Isolate or protect "clean" system components including pumps and pressure vessels and any component that may be damaged.
      d. Open all valves, drains, vents, strainers, and the like at all system levels. Close all valves isolating piping from the existing central piping systems.
      e. Remove plugs, caps, spool pieces, and components to facilitate early discharge from the system.
      f. Sectionalized system to obtain debris carrying velocity of six feet per second.
      g. Connect dead end supply and return headers and the like as necessary, or provide drains in dead end eccentric caps.
      h. Install temporary strainers where necessary to protect downstream equipment.
      i. Supply and drain-off "flushing" water by fire hoses, garden hoses, temporary or permanent piping, Contractor's booster pumps, and the like.
      j. Flush for not less than four hours. Drain all dirt legs. If water drained is not visibly clean, repeat the above procedure until dirt legs are visibly clean.
      k. Before starting the cleaning and flushing process, confirm a thermometer has been installed on the system. During flushing and cleaning process, monitor the water temperature to ensure the water temperature does not become too hot.
   2. Cleaning (Closed Systems Only):
      a. Utilize defoamers to preclude damage to existing work, and specifically adjacent electrical equipment.

b. Utilize heat to maximize effectiveness of compounds or use live steam injection where practical and safe. Do not raise cleaning water temperature in excess of 150 degrees F. Install a thermometer in the piping system and constantly monitor the water during cleaning to prevent over-heating.
c. Install temporary strainers, reinforced against blowout, sized to not impair equipment performance, to preclude passing of particles larger than 60% of smallest radial and at a minimum to retain all particles larger than 1000 microns.
d. Permanent facility pumps shall not be used for circulating cleaning water. Contractor shall supply temporary pumps for this process.
    1) If the system construction, flow rates, and pressures are such that it is impractical for the Contractor to provide temporary pumps, the permanent facility pumps may be used with the specific express permission of the Owner, provided the guarantee on the entire pump assembly is unconditionally extended for two years after date of Substantial Completion. Leakage from pump seals or other damage resulting from circulating the uncleaned water shall require immediate rectification at no additional cost to the Owner.
e. Add 20 pounds of Garratt Callahan Formula 248, or equal, alkaline cleaner for each 1000 gallons of system water for chemical cleaning (approximate .2% solution). Formula 248 is a dry blend of buffered phosphates, a corrosion inhibitor, a surfactant, and an iron oxide sequestrant.
f. Circulate for a period of at least 72 hours.
g. Every eight hours, blow-down the condensers and system low points for three minutes.
h. Drain and flush the system. Rapid flushing from the lowest point in the system is needed to remove debris.
i. Inspect the system and repeat first four steps.
j. Begin the corrosion control program immediately at double the normal inhibitor dosage for one week. After one week, drop to the normal dosage.
k. Chemical treatment compound: Use Garratt Callahan Company Formula 12-L closed system inhibitor strictly following manufacturer's directions.

3.10 OPERATION OF HVAC SYSTEMS DURING CONSTRUCTION

A. Install all specified filters prior to system operation. In addition to specified filters, install a roughing filter upstream of mixed air filter. Roughing filter shall consist of two layers of roll filter media clipped and sealed to entering side of filter frame. Change roughing filter as necessary to minimize dust collection on specified filters.

B. Cover return and exhaust air grilles with temporary filter media. Attach media to avoid damage to grille or ceiling. Change temporary media as required to protect against dust buildup on ductwork. Remove temporary media from grilles after flooring is installed, walls are sanded and painted and other dust generating construction has been completed.

C. During periods of excessive dust generation such as drywall sanding, seal off return and exhaust openings and grilles to prevent dust from accumulating in ductwork.

D. If outside air source contains less dust than building air, adjust A/C unit dampers to operate with as much outside air as possible without causing a freezing condition for coil or exceeding capacity of coil to adequately condition supply air.

E. Furnish and install a new set of specified filter media prior to start of system test and balance. Furnish a new, clean set of the specified media and turn over to Owner's Representative.

3.11 TESTING MECHANICAL SYSTEMS

A. Test all systems and equipment installed to demonstrate proper operation.

B. Advise Architect of scheduled systems testing and completed system demonstration/operation schedules so that he may witness, if desired.

C. Correct and retest work found defective when tested.

D. Make repairs to piping systems with new materials. Peening, doping, or caulking of joints or holes will not be acceptable.

E. HVAC Circulating Water Piping: Hydrostatically test piping at 150 psig pressure or at 1-1/2 times design pressure as indicated on drawings, whichever is greater, for a period of six hours without evidence of leaking.

F. Steam and Steam Condensate Piping: Hydrostatically test piping at 150 psig pressure or 1-1/2 times design working pressure for a period of six hours without evidence of leaking.

G. Fuel Oil Piping: Test piping with nitrogen at 100 psi pressure for two hours without evidence of leaking.

H. Ductwork Pressure Testing: Refer to Section 23 31 13 for required pressure testing for ductwork.

I. Chemical Water Treatment Systems: Have equipment manufacturer field check installations of boiler water treatment systems, and cooling tower water treatment systems, including field calibration of pumps, controllers and other operable parts. Chemical water treatment for HVAC including cleaning, testing, and treatment shall be performed in accordance with Section 23 25 00.

J. System Balance and Testing: Prepare to assist test and balance firm by assuring systems are complete and operational.

K. Test all smoke and combination fire/smoke, dampers by observing damper operation during fire alarm system commissioning.

L. Records of Testing: Maintain records of system testing and results thereof. Deliver results as part of project closing file and on an intermediate basis as requested by Architect.

END OF SECTION

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SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single phase electric motors.

B. Three phase electric motors.

1.2 RELATED REQUIREMENTS

A. Section 26 27 17 - Equipment Wiring

B. Section 26 29 13 - Enclosed Controllers

C. Section 26 29 23 - Variable Frequency Motor Controllers

1.3 REFERENCE STANDARDS

A. Each motor, controller and all components shall be designed, manufactured and tested in accordance with the folling applicable standards:
   1. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.
   2. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; 2004.
   3. IEEE Standard 112, Test Method "B"; 1996.
   4. IEEE Standard 444 (ANSI C34.3); 1992.
   5. IEEE Standard 519; 1992.
   6. NEMA MG 1 - Motors and Generators; 2014.
   7. NEMA MG1, Part 31 - Definite Purpose, Inverter Fed Motors; 2012.
   8. NEMA - ICS-3-303
   9. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
   10. Energy Policy Act of 1992

B. All equipment and material to be furnished and installed on this Project shall be UL or ETL listed, in accordance with the requirements of the authorities having jurisdiction, and suitable for it's intended use on this Project.

1.4 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Submit motor information with submittals and shop drawings for Division 23 equipment.

C. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

D. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.

E. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

F. Operation Data: Include instructions for safe operating procedures.

G. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.5 QUALITY ASSURANCE

A. Conform to NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.7 WARRANTY

A. See Division 01 for additional warranty requirements.

B. Provide two year manufacturer warranty from the date of substantial completion for motors smaller than 20 horserpower.

C. Provide five year manufacturer warranty from the date of substantial completion for motors 20 horsepower and larger.

PART 2 PRODUCTS

2.1 ACCEPTABLE **MANUFACTURERS**

A. Baldor, General Electric, Gould, Lincoln, MagneTek/Century, Marathon, Reliance, Siemens, Toshiba, U.S. Motors, and Westinghouse.

B. Substitutions: Refer to Division 01.

2.2 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service:
   1. Motors 1/2 HP and smaller: 115 volts, single phase, 60 Hz.
   2. Motors larger than 1/2 Horsepower: 460 volts, three phase, 60 Hz.

B. Windings and Insulation:
   1. All motors shall have copper windings.
   2. Motors shall be equipped with Class B, 80 deg. C rise or Class F, 105 deg. C rise insulation suitable for use in a 40 deg. C ambient temperature.

3. Motors used for cooling tower applications shall be equipped with Class F, 105 deg. C insulation suitable for use in a 40 deg. C ambient temperature. Windings shall be treated with an epoxy varnish to inhibit the moisture absorption.

C. Bearings:
1. Single phase, fractional horsepower motors shall be equipped with quiet operating, all angle babbitt lined sleeve bearings.
2. Polyphase motors shall be equipped with deep groove type ball bearings, generously sized for the loads to which applied and for severe duty application. Provide the necessary seals on the shaft to keep the bearing system free of contamination and moisture. Lubricant shall be high temperature, nonbleeding grease.
   a. Provide inlet and outlet plugs on poly phase motors so that grease fittings can be easily inserted for bearing lubrication except as otherwise specified. The end shields shall be carefully machined to add extra grease capacity. Lower outlet plugs shall be equipped with combination breather/drains on TEFC and TEAO motors.

D. Motors on belt driven equipment shall have slide rails with adjusting screws for belt tension adjustment.

E. Motors specified with variable frequency motor controllers shall comply with NEMA MG1, Part 31 for Definite Purpose, Inverter Fed motors including insulation meeting the requirement for 1600 Vpk at 0.1 uS rise time. In addition to compliance with MG1, Part 31, motors also shall be designed for starting across the line and specifically designed to reduce inrush current.
1. To protect motor bearings and shafts from damage due to induced electrical currents along the motor shaft, provide Aegis shaft grounding ring (SGR), conductive microfiber motor shaft grounding ring on the driven end of all inverter fed motors. For inverter fed motors 100 HP and larger, also provide either an insulated motor bearing or a ceramic bearing on non-driven end of motor. Comply with manufacturer's installation instructions and with NEMA MG1, Part 31 for inverter fed motor bearings.

F. Sound power levels shall not be greater than recommended in NEMA M61-12.49. Inverter duty rated motors shall not increase by more than 3 dB when operating on a variable frequency motor controller.

G. Provide motors with drive shafts long enough to extend completely through belt sheaves when sheaves are properly aligned and balanced.

H. Motors exposed to the weather shall be weather protected.

I. Install premium efficiency electric motors for motors 1 horsepower and above. Premium efficiency motors shall have efficiency and losses determined in accordance with the latest revisions of IEEE Standard 112. Polyphase squirrel cage motors rated 1 through 150 horsepower shall be tested by dynamometer method B. The efficiency shall be determined using segregated losses in which stray load loss is obtained from a linear regression analysis to reduce the effect of random errors in the test measurements. Guaranteed minimum load efficiency shall be as follows:
1. HP:3/4 Eff:80.0%
2. HP:1 Eff:84.0%
3. HP:1 1/2 Eff:86.5%
4. HP:2 Eff:86.5%
5. HP:3 Eff:89.5%
6. HP:5 Eff:89.5%
7. HP:7 1/2 Eff:91.7%

8. HP:10 Eff:91.7%
9. HP:15 Eff:93.0%
10. HP:20 Eff:93.6%
11. HP:25 Eff:93.6%
12. HP:30 Eff:94.1%
13. HP:40 Eff:94.5%
14. HP:50 Eff:95.0%
15. HP:60 Eff:95.4%
16. HP:75 Eff:95.4%
17. HP:100 Eff:95.4%
18. HP:125 Eff:95.4%
19. HP:150 Eff:95.4%

J. Explosion-Proof Motors: UL approved and labeled for hazard classification, with over temperature protection.

K. Motors shall be specifically designed for quiet operation and for severe duty. Standard open drip proof motors shall be equipped with aluminum or stainless steel stamped nameplates. Totally enclosed fan cooled and air over motors shall be equipped with stainless steel stamped nameplates with either zinc or cadmium plated hardware. Motor nameplates shall clearly indicate manufacturer's name and model number, frame size, horsepower, frequency, voltage, RPM, starting torque class, insulation class, full load amps, locked rotor amps, service factor, power factor, efficiency and winding material.

L. Motors shall be specifically designed for quiet operation and for severe duty. Standard open drip proof motors shall be equipped with aluminum or stainless steel stamped nameplates. Totally enclosed fan cooled and air over motors shall be equipped with stainless steel stamped nameplates with either zinc or cadmium plated hardware. Motor nameplates shall clearly indicate frame size, horsepower, frequency, voltage, speed, starting torque class, insulation class, service factor and winding material.

M. Wiring Terminations:
1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.3 APPLICATIONS

A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not conform to these specifications.

B. Single phase motors for shaft mounted fans, oil burners, and centrifugal pumps: Split phase type.

C. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.

D. Single phase motors for fans, pumps, blowers, and air compressors: Capacitor start type.

E. Single phase motors for fans, blowers, and pumps: Capacitor start, capacitor run type.

F. Three phase motors for blowers, fans, pumps, and other HVAC equipment: Squirrel cage type.

G. Motors located in exterior locations, wet air streams downstream of sprayed coil dehumidifiers, draw through cooling towers, air cooled condensers, humidifiers, direct drive axial fans, roll filters, explosion proof environments, and dust collection systems: Totally enclosed type.

H. Motors located in outdoors, in wet air streams downstream of sprayed coil dehumidifiers, in draw through cooling towers, and in humidifiers: Totally enclosed weatherproof epoxy-treated type.

I. Motors located outdoors and in draw through cooling towers: Totally enclosed weatherproof epoxy-sealed type.

2.4 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings, automatic reset overload protector.

2.5 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Multiple Speed: Through tapped windings.

D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.6 SINGLE PHASE POWER - CAPACITOR START MOTORS

A. Starting Torque: Three times full load torque.

B. Starting Current: Less than five times full load current.

C. Pull-up Torque: Up to 350 percent of full load torque.

D. Breakdown Torque: Approximately 250 percent of full load torque.

E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.

G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings, automatic reset overload protector.

2.7 THREE PHASE POWER - SQUIRREL CAGE MOTORS

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.

D. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.

E. Insulation System: NEMA Class B or better.

F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.

G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

H. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors embedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter; refer to Section 26 29 13.

I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

J. Sound Power Levels: To NEMA MG 1.

K. Part Winding Start Where Indicated: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.

L. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.

M. Nominal Efficiency: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

N. Nominal Power Factor: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install base mounted motors securely on firm foundation.

C. Align motors on direct drive equipment using dial type gauges.

D. Check line voltage and phase and ensure agreement with nameplate. Test motor for proper rotation under Division 26.

3.2 ADJUSTMENTS

A. Motors, together with driven equipment, shall be dynamically and statically balanced. Imbalance shall be reduced to minimum specified by equipment manufacturers.

END OF SECTION 23 05 13

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SECTION 23 05 16 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flexible pipe connectors.

1.2 RELATED REQUIREMENTS

A. Section 23 05 00 - Common Work Results for HVAC

B. Section 23 21 13 - HVAC Piping

1.3 REFERENCE STANDARDS

A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.

B. EJMA (STDS) - EJMA Standards; Tenth Edition.

1.4 SUBMITTALS

A. Submit product data and information for review in accordance with the requirements of Division 01.

B. Product Data:
   1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
   2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

C. Design Data: Indicate selection calculations.

D. Manufacturer's Instructions: Indicate manufacturer's installation instructions, special procedures, and external controls.

E. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Division 01 - Product Requirements, for additional provisions.
   2. Extra Packing for Packed Expansion Joints: One set for each joint.

1.5 REGULATORY REQUIREMENTS

A. Conform to UL requirements.

PART 2 PRODUCTS

2.1 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

A. Acceptable Manufacturers:
   1. Mercer Rubber Company; Model _____
   2. Metraflex Company; Model _____
   3. Substitutions: Refer to Division 01.

B. Inner Hose: Carbon Steel.

C. Exterior Sleeve: Single braided, stainless steel.

D. Pressure Rating: 125 psi and 450 degrees F.

E. Joint: Flanged.

F. Size: Use pipe sized units.

G. Maximum offset: 3/4 inch on each side of installed center line.

H. Application: Steel piping.

2.2 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

A. Acceptable Manufacturers:
   1. Mercer Rubber Company; Model _____
   2. Metraflex Company; Model _____
   3. Substitutions: Refer to Division 01..

B. Inner Hose: Bronze.

C. Exterior Sleeve: Braided bronze.

D. Pressure Rating: 125 psi and 450 degrees F.

E. Joint: Flanged.

F. Size: Use pipe sized units.

G. Maximum offset: 3/4 inch on each side of installed center line.

H. Application: Copper piping.

2.3 ACCESSORIES

A. Stainless Steel Pipe: ASTM A269/A269M.

B. Pipe Alignment Guides:
   1. Acceptable Manufacturers:
   2. Substitutions: Refer to Division 01.

3. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inches travel.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.

C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.

D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

E. Anchor pipe to building structure where indicated. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.

F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

END OF SECTION 23 05 16

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SECTION 23 05 23

GENERAL-DUTY VALVES FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Valves for chilled water systems.

B. Valves for heating water systems.

1.2 RELATED REQUIREMENTS

A. Section 23 21 13 - HVAC Piping

B. Section 23 07 00 - HVAC Insulation

1.3 SUBMITTALS

A. Submit product data for review in accordance with the requirements of Division 01.

B. Indicate valve service, construction material, sizes and locations to be used. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.4 QUALITY ASSURANCE

A. Valve Bodies, Shells, and Seats: Factory tested.

B. Bronze Body Valves:
1. Materials for pressure containing parts: ASTM B-62 (less than 200 psi), B-61 (200 psi and above)
2. Design, workmanship, testing: MSS-SP-80

C. Iron Body Valves:
1. Materials for pressure containing parts: ASTM A126, Grade B
2. Face-to-face and end-to-end dimensions: ANSI B16.10
3. Design, workmanship, testing: MSS-SP-70, 71 and 78.

D. Butterfly Valves:
1. Face-to-face and end-to-end dimensions: MSS-SP-67

E. Valve Stems: ASTM B584-78, Class 13C (cast silicon brass), ASTM B-371-79, Alloy A (rolled silicon brass), or other material equally resistant to dezincification.

F. Pressure Castings: Free of impregnating materials.

G. Valve name or trademark and working pressure stamped or cast into body.

H. Standard for 200 PSI and 300 PSI valves with metallic seats: ASTM B61-76.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Iron body valves: Crane, Dezurik, Kennedy, Kitz, Milwaukee, Mueller, Nibco, or Stockham, or approved equal

B. Bronze body valves: Dezurik, Kennedy, Kitz, Milwaukee, Nibco, or Stockham, or approved equal

C. Butterfly valves: Crane, Dezurik, Milwaukee, Mueller, Nibco, or Stockham, or approved equal.

D. Ball valves: Apollo, Hammond, Jamesbury, Kitz, Milwaukee, Nibco, or Watts, or approved equal

2.2 MATERIALS

A. Nibco Figure numbers are indicated below unless noted otherwise:

B. Valve Connections: Two inches and smaller - threaded; 2-1/2 inches and larger - flanged.

C. Provide chain operators for gate valves, butterfly valves, and plug cocks located in mechanical rooms as required by mechanical plans or where valves are mounted above 7'-0" A.F.F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish and install valves in each piping connection at each piece of HVAC equipment to allow equipment to be isolated from piping systems.

B. Furnish and install valves in all piping systems to isolate each floor or main section of the building. Install sufficient number of valves to minimize the portion of the system which must be shut down for service or maintenance purposes.

C. Install valves in water piping systems so ordinary maintenance work can be performed on the equipment that the valves isolate, without having to drain the system beyond the valve.

D. Locate valves so as to be easily accessible by maintenance personnel. Installation shall be made so that the valve can be fully opened and have a minimum clearance of 6" beyond valve stem end at the full open position and will include sufficient clearance for removal of stem for repair.

E. Identify valves as required by Section 23 05 53.

END OF SECTION

SECTION 23 09 23

DIRECT-DIGITAL CONTROL SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Building Automation System (BAS) for control and monitoring of all HVAC equipment including RTU's, split DX systems, AHU's, chillers, boilers, exhaust fans, and return/relief fans.

B. The BAS shall incorporate, at a minimum, the following integrated features, functions and services:
   1. Operator information, alarm management and control functions.
   2. Diagnostic monitoring and reporting of BAS functions.
   3. Energy management
   4. Standard applications for terminal HVAC systems.
   5. Indoor Air Quality monitoring and control.

1.2 RELATED REQUIREMENTS

A. Section 23 05 00 - Common Work Results for HVAC

B. Section 23 05 93 - HVAC Systems Test and Balance

C. Section 23 09 13 - Instrumentation and Control Devices

D. Division 26: Electrical

1.3 REFERENCE STANDARDS

A. All work shall conform to the following Codes and Standards, as applicable:
   1. National Fire Protection Association (NFPA) Standards.
   2. National Electric Code (NEC) and applicable local Electric Code.
   3. Underwriters Laboratories (UL) listing and labels.
   4. International Building Code.
   5. UL 864 UUKL Smoke Control
   6. UL 268 Smoke Detectors.
   7. UL 916 Energy Management
   8. NFPA 70 - National Electrical Code.
   9. NFPA 90A - Standard For The Installation Of Air Conditioning And Ventilating Systems.
   10. NFPA 92A and 92B Smoke Purge/Control Equipment.
   11. Factory Mutual (FM).
   12. American National Standards Institute (ANSI).
   13. National Electric Manufacturer's Association (NEMA).
   14. American Society of Mechanical Engineers (ASME).
   15. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
   16. Air Movement and Control Association (AMCA).
   17. Institute of Electrical and Electronic Engineers (IEEE).
   18. American Standard Code for Information Interchange (ASCII).
   19. Electronics Industries Association (EIA).
   20. Occupational Safety and Health Administration (OSHA).

21. American Society for Testing and Materials (ASTM).
22. Federal Communications Commission (FCC) including Part 15, Radio Frequency Devices.
23. Americans Disability Act (ADA)
24. ANSI/EIA 909.1-A-1999 (LonWorks)
25. ANSI/ASHRAE Standard 195-2004 (BACnet)

B. In the case of conflicts or discrepancies, the more stringent regulation shall apply.

C. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

1.4 SUBMITTALS

A. Shop Drawings, Product Data, and Samples
1. Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the BAS Supplier/Installer where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.
2. The BAS Supplier/Installer shall correct any errors or omissions noted in the first review.
3. At a minimum, submit the following:
   a. BAS network architecture diagrams including all nodes and interconnections.
   b. Systems schematics, sequences and flow diagrams.
   c. Points schedule for each point in the BAS, including: Point Type, Object Name, Expanded ID, Display Units, Controller type, and Address.
   d. Samples of Graphic Display screen types and associated menus.
   e. Detailed Bill of Material list for each system or application, identifying quantities, part numbers, descriptions, and optional features.
   f. Control Damper Schedule including a separate line for each damper provided under this section and a column for each of the damper attributes, including: Code Number, Fail Position, Damper Type, Damper Operator, Duct Size, Damper Size, Mounting, and Actuator Type.
   g. Control Valve Schedules including a separate line for each valve provided under this section and a column for each of the valve attributes: Code Number, Configuration, Fail Position, Pipe Size, Valve Size, Body Configuration, Close off Pressure, Capacity, Valve CV, Design Pressure, and Actuator Type.
   h. Room Schedule including a separate line for each VAV box and/or terminal unit indicating location and address
   i. Details of all BAS interfaces and connections to the work of other trades.
   j. Product data sheets or marked catalog pages including part number, photo and description for all products including software.

1.5 WARRANTY

A. Standard Material and Labor Warranty:
1. From date of substantial completion for the BAS system, provide a one-year labor and material warranty on the BAS.
2. If within twelve (12) months from the date of acceptance of product, upon written notice from the owner, it is found to be defective in operation, workmanship or materials, it shall be replaced, repaired or adjusted at the option of the BAS Supplier/Installer at the cost of the BAS Supplier/Installer.
3. Maintain an adequate supply of materials within 100 miles of the Project site such that replacement of key parts and labor support, including programming. Warranty work shall be done during BAS Supplier/Installer's normal business hours.

PART 2 - PRODUCTS

2.1 GENERAL

A. The Building Automation System (BAS) shall use an open architecture and fully support a multi-vendor environment. To accomplish this effectively, the BAS shall support open communication protocol standards and integrate a wide variety of third-party devices and applications. The system shall be designed for use on the Internet, or intranets using off the shelf, industry standard technology compatible with other owner provided networks.

B. The Building Automation System shall consist of the following:
   1. Standalone Network Automation Engine(s)
   2. Field Equipment Controller(s)
   3. Input/Output Module(s)
   4. Local Display Device(s)
   5. Distributed User Interface(s)
   6. Network processing, data storage and communications equipment
   7. Other components required for a complete and working BAS

C. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices, while re-using existing controls equipment.

D. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

2.2 ACCEPTABLE MANUFACTURERS

A. Johnson Controls - Metasys or Siemens Building Systems - APOGEE, or approved equal.

2.3 BUILDING AUTOMATION SYSTEM (BAS) ARCHITECTURE

A. Automation Network
   1. The automation network shall be based on a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard "off the shelf" products available through normal PC vendor channels.
   2. The BAS shall network multiple user interface clients, automation engines system controllers and application-specific controllers. Provide application and data servers as required for systems operation.
   3. The automation network shall be capable of operating at communication speed of 100 Mbps, with full peer-to-peer network communication.
   4. Network Automation Engines (NAE) shall reside on the automation network.
   5. The automation network will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.

B. Control Network
   1. Network Automation Engines shall provide supervisory control over the control network and shall support all three (3) of the following communication protocols:
      a. BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9.

b. LonWorks enabled devices using the Free Topology Transceiver (FTT-10a).
c. The Johnson Controls N2 Field Bus.

2. Control networks shall provide either "Peer-to-Peer," Master-Slave, or Supervised Token Passing communications, and shall operate at a minimum communication speed of 9600 baud.
3. DDC Controllers shall reside on the control network.
4. Control network communication protocol shall be BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135.
5. A BACnet Protocol Implementation Conformance Statement shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.
6. The Conformance Statements shall be submitted 10 day prior to bidding.

2.4 USER INTERFACE

A. Operating System Software
1. Where user interface is not provided via browser, provide complete operator workstation software package, including any hardware or software keys. Include the original installation disks and licenses for all included software, device drivers, and peripherals.
2. Provide software registration cards to the Owner for all included software.

B. BAS Workstation
1. Provide computer of sufficient capacity to run all BAS monitoring and control software, allow extended storage of trend data and other applications. Consult with owner's IT department to ensure hardware and operating system network compatibility. The minimum requirements include:
   a. HP RAID 5 Server (specs below):
      1) HP Z420 Workstation
      2) HP Single Unit Packaging
      3) HP Z420 600W 90% Efficient Chassis
      4) Windows 7 Professional 64bit OS
      5) Windows 7 64-bit Factory Image Recovery
      6) 16X SuperMulti DVD R/W SATA ODD
      7) HP Processor Air Cooling Kit
      8) RAID 5 Boot HDD+Parity Array Config
      9) Four 1TB 7200 RPM SATA 2nd HDD's
      10) HP Z420 Front Memory Duct
      11) HP USB wireless keyboard (101 key)
      12) HP USB wireless optical mouse
      13) NVIDIA Quadro 410 512MB 1st UEFI GFX
      14) 32GB DDR3-1866 ECC RAM
      15) Intel Xeon E5-1607v2 3.0 10M 1600 4C CPU
      16) LSI 9270-8iSAS 6Gb/s ROC RAID Card
      17) Two 24” LED energy efficient display monitors with soundbar and required display port adapters
      18) 3-year parts, labor, and on-site repair warranty
2. Peripheral Hardware
   a. Reports printer:
      1) Printer Make - Hewlett Packard Color DeskJet
      2) Print Speed - 600 DPI Black, 300 DPI Color
      3) Buffer - 64 K Input Print Buffer

3. Provide a battery powered UPS capable of powering the BAS front end computer, printer, monitors and BAS functions for a minimum period of 15 minutes upon loss of normal power.
4. Provide a battery powered UPS capable of powering network switches and routers associated with the BAS for a minimum period of 15 minutes upon loss of normal power. UPS device(s) may be eliminated if provided by owner's IT department and fully functional during the BAS startup/commissioning process. Coordinate location of UPS with owner's IT department.

C. User Interface Application Components
1. Operator Interface
   a. An integrated browser based client application shall be used as the user operator interface program. All inputs, outputs, setpoints, and all other parameters as defined within Part 3, shown on the design drawings, or required as part of the system software, shall be displayed for operator viewing and modification from the operator interface software.
   b. The user interface software shall provide help menus and instructions for each operation and/or application. All controller software operating parameters shall be displayed for the operator to view/modify from the user interface. These include: setpoints, alarm limits, time delays, PID tuning constants, run-times, point statistics, schedules, and so forth.
   c. The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:
      1) User access for selective information retrieval and control command execution
      2) Monitoring and reporting
      3) Alarm, non-normal, and return to normal condition annunciation
      4) Selective operator override and other control actions
      5) Information archiving, manipulation, formatting, display and reporting
      6) BAS internal performance supervision and diagnostics
      7) On-line access to user HELP menus
      8) On-line access to current BAS as-built records and documentation Means for the controlled re-programming, re-configuration of BAS operation and for the manipulation of BAS database information in compliance with the prevailing codes, approvals and regulations for individual BAS applications.
   d. The operation of the control system shall be independent of the user interface, which shall be used for operator communications only. Systems that rely on an operator workstation to provide supervisory control over controller execution of the sequences of operations or system communications shall not be acceptable.
2. Navigation Trees
   a. The system will have the capability to display multiple navigation trees that will aid the operator in navigating throughout all systems and points connected. At minimum provide a tree that identifies all systems on the networks.
   b. Provide the ability for the operator to add custom trees. The operator will be able to define any logical grouping of systems or points and arrange them on the tree in any order. It shall be possible to nest groups within other groups. Provide at minimum 5 levels of nesting.
   c. The navigation trees shall be "dockable" to other displays in the user interface such as graphics. This means that the trees will appear as part of the display, but can be detached and then minimized to the Windows task bar or closed altogether. A simple keystroke will reattach the navigation to the primary display of the user interface.
3. Alarms

a. Alarms shall be routed directly to PCs and servers. It shall be possible for specific alarms from specific points to be routed to specific PCs and servers.
b. The alarm management portion of the user interface shall, at the minimum, provide the following functions:
    1) Log date and time of alarm occurrence.
    2) Generate a "Pop-Up" window, with audible alarm, informing a user that an alarm has been received.
    3) Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.
    4) Provide an audit trail on hard drive for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.
    5) Provide the ability to direct alarms to an e-mail address or alphanumeric pager. This must be provided in addition to the pop up window described above. Systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.
    6) Any attribute of any object in the system may be designated to report an alarm.
c. The BAS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions.
d. The BAS shall annunciate application alarms as specified herein and as shown on Drawings.

4. Reports and Summaries
    a. Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:
        1) All points in the BAS
        2) All points in each BAS application
        3) All points in a specific controller
        4) All points in a user-defined group
        5) All points currently in alarm
        6) All points locked out
        7) All points in override
        8) All BAS schedules
        9) All user defined and adjustable variables, schedules, and interlocks.
    b. Summaries and Reports shall be accessible via standard user interface functions and not dependent upon custom programming or user defined HTML pages.
    c. Selection of a single menu item, tool bar item, or tool bar button shall print any displayed report or summary on the system printer for use as a building management and diagnostics tool.
    d. The system shall allow for the creation of custom reports and queries via a standard web services XML interface and commercial off-the-shelf software such as Microsoft Access, Microsoft Excel, or Crystal Reports.
5. Schedules
    a. A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:
        1) Weekly schedules
        2) Exception Schedules
        3) Monthly calendars.
        4) Weekly schedules shall be provided for each group of equipment with a specific time use schedule.

5) It shall be possible to define one or more exception schedules for each schedule including references to calendars
6) Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days for a minimum of five years in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the exception schedules.
7) Changes to schedules made from the User Interface shall directly modify the affected controller(s) schedule database.
8) Schedules and Calendars shall comply with ASHRAE SP135/2003 BACnet Standard. Selection of a single menu item or tool bar button shall print any displayed schedule on the system printer for use as a building management and diagnostics tool.

6. Password
   a. Multiple-level password access protection shall be provided to allow the user/manager to user interface control, display, and database manipulation capabilities deemed appropriate for each user, based on an assigned password.
   b. Each user shall have the following: a user name (24 characters minimum), a password (12 characters minimum), and access levels.
   c. The system shall allow each user to change his or her password at will.
   d. When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.
   e. A minimum of five levels of access shall be supported individually or in any combination as follows:
      1) Level 1 = View Data
      2) Level 2 = Command
      3) Level 3 = Operator Overrides
      4) Level 4 = Database Modification
      5) Level 5 = Database Configuration
      6) Level 6 = All privileges, including Password Add/Modify
   f. A minimum of 100 unique passwords shall be supported.
   g. Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.
   h. The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules or history collection parameters, and all changes to the alarm management system, including the acknowledgment and deletion of alarms.
7. Screen Manager
   a. The User Interface shall be provided with screen management capabilities that allow the user to activate, close, and simultaneously manipulate a minimum of 4 active display windows plus a network or user defined navigation tree.
8. Dynamic Color Graphics
   a. The graphics application program shall be supplied as an integral part of the User Interface. Browser or workstation applications that rely only upon HTML pages shall not be acceptable.
   b. The graphics applications shall include a create/edit function and a runtime function. The system architecture shall support an unlimited number of graphics documents (graphic definition files) to be generated and executed.
   c. The graphics shall be able to display and provide animation based on real-time data that is acquired, derived, or entered. A maximum of 16 graphic applications shall be

able to execute at any one time on a user interface or workstation with 4 visible to the user. Each graphic application shall be capable of the following functions:
1) All graphics shall be fully scalable
2) The graphics shall support a maintained aspect ratio.
3) Multiple fonts shall be supported.
4) Unique background shall be assignable on a per graphic basis.
5) The color of all animations and values on displays shall indicate if the status of the object attribute.

d. It shall be possible to change setpoints and states in system controlled equipment by using drop-down windows accessible via the pointing device.
e. A graphic editing tool shall be provided that allows for the creation and editing of graphic files. The graphic editor shall be capable of performing/defining all animations, and defining all runtime binding.
1) The graphic editing tool shall provide for the creation and positioning of point objects by dragging from tool bars or drop-downs and positioning where required.
2) The graphic editing tool shall be able to add additional content to any graphic by importing backgrounds in the SVG, BMP or JPG file formats.

f. Aliasing - Many graphic displays representing part of a building and various building components are exact duplicates, with the exception that the various variables are bound to different field values. It shall be possible to bind the value of a graphic display to aliases, as opposed to the physical field tags.

9. Historical trending and data collection
a. Each controller shall store trend and point history data for all analog and digital inputs and outputs, as follows:
1) Any point, physical or calculated, may be designated for trending. Three methods of collection shall be allowed:
(a) Defined time interval
(b) Upon a change of value
(c) Upon reaching a user input threshold value
2) Each controller shall have the capability to store multiple samples for each physical point and software variable based upon available memory, including an individual sample time/date stamp. Points may be assigned to multiple history trends with different collection parameters.
3) Trend and change of value data shall be stored within the engine and uploaded to a dedicated trend database or exported in a selectable data format via a provided data export utility. Uploads to a dedicated database shall occur based upon user-defined interval, manual command, or when the trend buffers are full. Exports shall be as requested by the user or on a time scheduled basis.
4) The system shall provide a configurable data storage subsystem for the collection of historical data. Data can be stored in either Microsoft Access or SQL database format.

10. Trend data viewing and analysis
a. Provide a trend viewing utility that shall have access to all database points.
b. It shall be possible to retrieve any historical database point for use in displays and reports by specifying the point name and associated trend name.
c. The trend viewing utility shall have the capability to define trend study displays to include multiple trends
d. Displays shall be able to be single or stacked graphs with on-line selectable display characteristics, such as range, color, and plot style.
e. Display magnitude shall automatically be scaled to show full graphic resolution of the data being displayed.

f. A zoom capability shall be provided to adjust the display magnitude and units as selected by the operator at any time without reconfiguring the processing or collection of data.
g. Trend studies shall be capable of calculating and displaying calculated variables including highest value, lowest value and time based accumulation.

2.5 NETWORK AUTOMATION ENGINES (NAE)

A. Network Automation Engine
1. The Network Automation Engine (NAE) shall be a fully user-programmable, supervisory controller. The NAE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Automation Engines.
2. Processor - The NAE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NAE size and capability shall be sufficient to fully meet the requirements of this Specification.
3. Memory - Each NAE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
4. Hardware Real Time Clock - The NAE shall include an integrated, hardware-Based, real-time clock.
5. Diagnostics - The NAE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Automation Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
6. Power Failure - In the event of the loss of normal power, The NAE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.
   a. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.
   b. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
7. Certification - The NAE shall be listed by Underwriters Laboratories (UL).
8. Controller network - The NAE shall support the following communication protocols on the controller network:
   a. The NAE shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network.
      1) A BACnet Protocol Implementation Conformance Statement shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.
      2) The Conformance Statements shall be submitted 10 day prior to bidding.
      3) The NAE shall support a minimum of 50 control devices.
   b. The NAE shall support LonWorks enabled devices using the Free Topology Transceiver FTT10.
      1) All LonWorks controls devices shall be LonMark certified.
      2) The NAE shall support a minimum of 64 LonWorks enabled control devices.
   c. The NAE shall support the Johnson Controls N2 Field Bus.
      1) The NAE shall support a minimum of 50 N2 control devices.
      2) The Bus shall conform to Electronic Industry Alliance (EIA) Standard RS-485.

3) The Bus shall employ a master/slave protocol where the NAE is the master.
4) The Bus shall employ a four (4) level priority system for polling frequency.
5) The Bus shall be optically isolated from the NAE.
6) The Bus shall support the Metasys Integrator System.

B. Network Automation Engine (NAE)
1. The Network Automation Engine (NAE) shall be a fully user-programmable, supervisory controller. The NAE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Automation Engines. Automation network -
2. The NAE shall reside on the automation network and shall support a subnet of system controllers.
3. User Interface - Each NAE shall have the ability to deliver a web based User Interface (UI) as previously described. All computers connected physically or virtually to the automation network shall have access to the web based UI.
4. The web based UI software shall be imbedded in the NAE. Systems that require a local copy of the system database on the user's personal computer are not acceptable.
   a. The NAE shall support up four (4) concurrent users.
   b. The web based user shall have the capability to access all system data through one NAE.
   c. Remote users connected to the network through an Internet Service Provider (ISP) or telephone dial up shall also have total system access through one NAE.
   d. Systems that require the user to address more than one NAE to access all system information are not acceptable.
   e. The NAE shall have the capability of generating web based UI graphics. The graphics capability shall be imbedded in the NAE.
   f. Systems that support UI Graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.
   g. The web based UI shall support the following functions using a standard version of Microsoft Internet Explorer:
      1) Configuration
      2) Commissioning
      3) Data Archiving
      4) Monitoring
      5) Commanding
      6) System Diagnostics
5. Processor - The NAE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NAE size and capability shall be sufficient to fully meet the requirements of this Specification.
6. Memory - Each NAE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
7. Hardware Real Time Clock - The NAE shall include an integrated, hardware-based, real-time clock.
8. The NAE shall include troubleshooting LED indicators to identify the following conditions:
   a. Power - On/Off
   b. Ethernet Traffic - Ethernet Traffic/No Ethernet Traffic
   c. Ethernet Connection Speed - 10 Mbps/100 Mbps
   d. FC Bus - Normal Communications/No Field Communications
   e. Peer Communication - Data Traffic Between NAE Devices
   f. Run - NAE Running/NAE In Startup/NAE Shutting Down/Software Not Running

g. Bat Fault - Battery Defective, Data Protection Battery Not Installed
h. Fault - General Fault
i. Modem RX - NAE Modem Receiving Data
j. Modem TX - NAE Modem Transmitting Data

9. Communications Ports - The NAE shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.
   a. Up to two (2) USB port
   b. Up to two (2) URS-232 serial data communication port
   c. Up to two (2) RS-485 port
   d. One (1) Ethernet port
10. Diagnostics - The NAE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Automation Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
11. Power Failure - In the event of the loss of normal power, The NAE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.
    a. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.
    b. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
12. Certification - The NAE shall be listed by Underwriters Laboratories (UL).
13. Controller network - The NAE shall support the following communication protocols on the controller network: Note: Items a, b, & c are specifications for BACnet, LonWorks, and N2. They should remain in the specification even though all three are not required.
    a. The NAE shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network.
       1) A BACnet Protocol Implementation Conformance Statement shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.
       2) The Conformance Statements shall be submitted 10 day prior to bidding.
       3) The NAE shall support a minimum of 100 control devices.
    b. The NAE shall support LonWorks enabled devices using the Free Topology Transceiver FTT10.
       1) All LonWorks controls devices shall be LonMark certified.
       2) The NAE shall support a minimum of 255 LonWorks enabled control devices. The NAE shall support the Johnson Controls N2 Field Bus.
       3) The NAE shall support a minimum of 100 N2 control devices.
       4) The Bus shall conform to Electronic Industry Alliance (EIA) Standard RS-485.
       5) The Bus shall employ a master/slave protocol where the NAE is the master.
       6) The Bus shall employ a four (4) level priority system for polling frequency.
       7) The Bus shall be optically isolated from the NAE.
       8) The Bus shall support the Metasys Integrator System.

2.6 DDC SYSTEM CONTROLLERS

A. Field Equipment Controller (FEC)
   1. Fully user-programmable, digital controller that communicates via BACnet MS/TP protocol.

2. Employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.
3. Factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable.
4. Assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
5. Include a removable base to allow pre-wiring without the controller.
6. Include troubleshooting LED indicators to identify the following conditions:
   a. Power On
   b. Power Off
   c. Download or Startup in progress, not ready for normal operation
   d. No Faults
   e. Device Fault
   f. Field Controller Bus - Normal Data Transmission
   g. Field Controller Bus - No Data Transmission
   h. Field Controller Bus - No Communication
   i. Sensor-Actuator Bus - Normal Data Transmission
   j. Sensor-Actuator Bus - No Data Transmission
   k. Sensor-Actuator Bus - No Communication
7. The FEC shall accommodate the direct wiring of analog and binary I/O field points.
8. The FEC shall support the following types of inputs and outputs:
   a. Universal Inputs: Configured to monitor any of the following:
      1) Analog Input, Voltage Mode Analog Input, Current Mode
      2) Analog Input, Resistive Mode
      3) Binary Input, Dry Contact Maintained Mode
      4) Binary Input, Pulse Counter Mode
   b. Binary Inputs: Configured to monitor either of the following:
      1) Dry Contact Maintained Mode
      2) Pulse Counter Mode
   c. Analog Outputs: Configured to output either of the following:
      1) Analog Output, Voltage Mode
      2) Analog Output, current Mode
   d. Binary Outputs: Output the following:
      1) 24 VAC Triac
   e. Configurable Outputs: Capable of the following:
      1) Analog Output, Voltage Mode
      2) Binary Output Mode
9. Ability to reside on a Field Controller Bus (FC Bus). The FC bus shall:
   a. Be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.
   b. Support communications between the FECs and the NAE.
   c. Support Input/Output Module (IOM) communications with the FEC and with the NAE.
   d. Support a minimum of 100 IOMs and FEC in any combination.
   e. Operate at a maximum distance of 15,000 Ft. between the FEC and the furthest connected device.
10. Ability to monitor and control a network of sensors and actuators over a Sensor-Actuator Bus (SA Bus). The SA bus shall:

a. Be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.
b. Support a minimum of 10 devices per trunk.
c. Operate at a maximum distance of 1,200 Ft. between the FEC and the furthest connected device.
d. Have capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the FC Bus or the SA Bus.

11. The FEC shall support, but not be limited to, the following:
    a. Hot water, chilled water/central plant applications
    b. Built-up air handling units for special applications
    c. Terminal units
    d. Special programs as required for systems control

B. Local Display Capability
1. LCD (Liquid Crystal Display) graphic display shall be provided. The LCD shall have a minimum of 16 lines of text with 40 characters per line. The following features shall be incorporated in the LCD graphic display:
    a. The ability to display and monitor up to 96 points for the system being controlled.
    b. A system graphical representation of the controlled equipment, including live point data from the system controller.
    c. An audible alarm and a light emitting diode (LED) to notify the user of alarm conditions.
    d. The ability to view an alarm summary that includes all the points currently in alarm, and to view an alarm log that shows the alarm history for the system being controlled.
    e. The ability to view trend graphs for the analog points being monitored by the system controller.
    f. A password system that allows for three levels of access to the system controller.

2.7 FIELD DEVICES

A. Input/Output Module (IOM)
1. The Input/Output Module (IOM) provides additional inputs and outputs for use in the FEC.
2. The IOM shall communicate with the FEC over either the FC Bus or the SA Bus using BACnet Standard protocol SSPC-135, Clause 9.
3. The IOM shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
4. The IOM shall have a minimum of 4 points to a maximum of 17 points.
5. The IOM shall support the following types of inputs and outputs:
    a. Universal Inputs - shall be configured to monitor any of the following:
        1) Analog Input, Voltage Mode
        2) Analog Input, Current Mode
        3) Analog Input, Resistive Mode
            (a) Binary Input, Dry Contact Maintained Mode
            (b) Binary Input, Pulse Counter Mode Binary Inputs - shall be configured to monitor either of the following:
            (c) Dry Contact Maintained Mode
            (d) Pulse Counter Mode
        4) Analog Outputs - shall be configured to output either of the following
            (a) Analog Output, Voltage Mode
            (b) Analog Output, current Mode
        5) Binary Outputs - shall output the following:

(a) 24 VAC Triac
6) Configurable Outputs - shall be capable of the following:
(a) Analog Output, Voltage Mode
(b) Binary Output Mode
b. The IOM shall include troubleshooting LED indicators to identify the following conditions:
1) Power On
2) Power Off
3) Download or Startup in progress, not ready for normal operation
4) No Faults
5) Device Fault
6) Normal Data Transmission
7) No Data Transmission
8) No Communication

B. Networked Thermostat (TEC)
1. Capable of controlling the following:
a. A four pipe fan coil system with multi-speed fan control.
b. A pressure dependant Variable Air Volume System or similar zoning type system using reheat.
c. A two pipe fan coil with a single speed fan.
2. Communicate over the Field Controller Bus using BACnet Standard protocol SSPC-135, Clause 9.
a. Support remote read/write and parameter adjustment from the web based User Interface through a Network Automation Engine.
3. Include an intuitive User Interface providing plain text messages. Two line, 8 character backlit display LED indicators for Fan, Heat, and Cool status
a. Five (5) User Interface Keys: Mode, Fan, Override, Degrees C/F, Up/Down
1) The display shall continuously scroll through the following parameters: Room Temperature
2) System Mode
3) Schedule Status - Occupied/Unoccupied/Override
4) Applicable Alarms
4. Provide the flexibility to support the following inputs:
a. Integral Indoor Air Temperature Sensor
b. Duct Mount Air Temperature Sensor
c. Remote Indoor Air Temperature Sensor with Occupancy Override and LED Indicator.
d. Two configurable binary inputs
5. Provide the flexibility to support the following outputs:
a. Three Speed Fan Control
b. On/Off Control
c. Floating Control
d. Proportional (0 to 10V) Control
6. Provide a minimum of six (6) levels of keypad lockout.
7. Provide the flexibility to adjust the following parameters:
a. Adjustable Temporary Occupancy from 0 to 24 hours
b. Adjustable heating/cooling deadband from 2o F to 5o F
c. Adjustable heating/cooling cycles per hour from 4 to 8
8. Employ nonvolatile electrically erasable programmable read-only memory (EEPROM) for all adjustable parameters.

C. VAV Modular Assembly (VMA)
   1. The VAV Modular Assembly shall provide both standalone and networked direct digital control of pressure-independent, variable air volume terminal units. It shall address both single and dual duct applications.
   2. The VAV Modular Assembly shall communicate over the FC Bus using BACnet Standard protocol SSPC-135, Clause 9.
   3. The VAV Modular Assembly shall have internal electrical isolation for AC power, DC inputs, and MS/TP communications. An externally mounted isolation transformer shall not be acceptable.
   4. The VAV Modular Assembly shall be a configurable digital controller with integral differential pressure transducer and damper actuator. All components shall be connected and mounted as a single assembly that can be removed as one piece.
   5. The VAV Modular Assembly shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
   6. The integral damper actuator shall be a fast response stepper motor capable of stroking 90 degrees in 30 seconds for quick damper positioning to speed commissioning and troubleshooting tasks.
   7. The controller shall determine airflow by dynamic pressure measurement using an integral dead-ended differential pressure transducer. The transducer shall be maintenance-free and shall not require air filters.
   8. Each controller shall have the ability to automatically calibrate the flow sensor to eliminate pressure transducer offset error due to ambient temperature / humidity effects.
   9. The controller shall utilize a proportional plus integration (PI) algorithm for the space temperature control loops.
   10. Each controller shall continuously, adaptively tune the control algorithms to improve control and controller reliability through reduced actuator duty cycle. In addition, this tuning reduces commissioning costs, and eliminates the maintenance costs of manually re-tuning loops to compensate for seasonal or other load changes.
   11. The controller shall provide the ability to download and upload VMA configuration files, both locally and via the communications network. Controllers shall be able to be loaded individually or as a group using a zone schedule generated spreadsheet of controller parameters.
   12. Control setpoint changes initiated over the network shall be written to VMA non-volatile memory to prevent loss of setpoint changes and to provide consistent operation in the event of communication failure.
   13. The controller firmware shall be flash-upgradeable remotely via the communications bus to minimize costs of feature enhancements.
   14. The controller shall provide fail-soft operation if the airflow signal becomes unreliable, by automatically reverting to a pressure-dependent control mode.
   15. The controller shall interface with balancer tools that allow automatic recalculation of box flow pickup gain ("K" factor), and the ability to directly command the airflow control loop to the box minimum and maximum airflow setpoints.
   16. Controller performance shall be self-documenting via on-board diagnostics. These diagnostics shall consist of control loop performance measurements executing at each control loop's sample interval, which may be used to continuously monitor and document system performance. The VMA shall calculate exponentially weighted moving averages (EWMA) for each of the following. These metrics shall be available to the end user for efficient management of the VAV terminals.
      a. Absolute temperature loop error.
      b. Signed temperature loop error.
      c. Absolute airflow loop error.

d. Signed airflow loop error.
e. Average damper actuator duty cycle.

17. The controller shall detect system error conditions to assist in managing the VAV zones. The error conditions shall consist of:
    a. Unreliable space temperature sensor.
    b. Unreliable differential pressure sensor.
    c. Starved box.
    d. Actuator stall
    e. Insufficient cooling.
    f. Insufficient heating.
18. The controller shall provide a flow test function to view damper position vs. flow in a graphical format. The information would alert the user to check damper position. The VMA would also provide a method to calculate actuator duty cycle as an indicator of damper actuator runtime.
19. The controller shall provide a compliant interface for ASHRAE Standard 62-1989 (indoor air quality), and shall be capable of resetting the box minimum airflow Based on the percent of outdoor air in the primary air stream.
20. The controller shall comply with ASHRAE Standard 90.1 (energy efficiency) by preventing simultaneous heating and cooling, and where the control strategy requires reset of airflow while in reheat, by modulating the box reheat device fully open prior to increasing the airflow in the heating sequence.
21. Inputs:
    a. Analog inputs with user defined ranges shall monitor the following analog signals, without the addition of equipment outside the terminal controller cabinet:
    b. 0-10 VDC Sensors
        1) 1000ohm RTDs
        2) NTC Thermistors
    c. Binary inputs shall monitor dry contact closures. Input shall provide filtering to eliminate false signals resulting from input "bouncing."
    d. For noise immunity, the inputs shall be internally isolated from power, communications, and output circuits.
    e. Provide side loop application for humidity control.
22. Outputs
    a. Analog outputs shall provide the following control outputs:
        1) 0-10 VDC
    b. Binary outputs shall provide a SPST Triac output rated for 500mA at 24 VAC.
    c. For noise immunity, the outputs shall be internally isolated from power, communications, and other output circuits.
23. Application Configuration
    a. The VAV Modular Assembly shall be configured with a software tool that provides a simple Question/Answer format for developing applications and downloading.
24. Sensor Support
    a. The VAV Modular Assembly shall communicate over the Sensor-Actuator Bus (SA Bus) with a Network Sensor.
    b. The VMA shall support an LCD display room sensor.
    c. The VMA shall also support standard room sensors as defined by analog input requirements.
    d. The VMA shall support humidity sensors defined by the AI side loop.

D. Network Sensors (NS)
1. The Network Sensors (NS) shall have the ability to monitor the following variables as required by the systems sequence of operations:

a. Zone Temperature
b. Zone humidity
c. Zone setpoint

2. The NS shall transmit the zone information back to the controller on the Sensor-Actuator Bus (SA Bus) using BACnet Standard protocol SSPC-135, Clause 9.
3. The Network Sensors shall include the following items:
   a. A backlit Liquid Crystal Display (LCD) to indicate the Temperature, Humidity and Setpoint.
   b. An LED to indicate the status of the Override feature.
   c. A button to toggle the temperature display between Fahrenheit and Celsius.
   d. A button to initiate a timed override command
4. The NS shall be available with either screw terminals or phone jack.
5. The NS shall be available in either surface mount or wall mount styles.

E. Many-To-One Wireless Room Temperature Sensor System (WRS)
1. The Many-To-One System Receiver (WRS Receiver) shall receive wireless Radio Frequency (RF) signals containing temperature data from multiple Wireless Room Temperature Sensors (WRS Sensors).
   a. The WRS Receiver shall use direct sequence spread spectrum RF technology.
   b. The WRS Receiver shall operate on the 2.4 GHZ ISM Band.
   c. The WRS Receiver shall meet the IEEE 802.15.4 standard for low-power, low duty-cycle RF transmitting systems.
   d. The WRS Receiver shall be FCC compliant to CFR Part 15 subpart B Class A.
   e. The WRS Receiver shall operate as a bidirectional transceiver with the sensors to confirm and synchronize data transmission.
   f. The WRS Receiver shall be capable of communication with WRS Sensors up to a distance of 200 Feet.
   g. The WRS Receiver shall be assembled in a plenum rated plastic housing with flammability rated to UL94-5VB.
   h. The WRS Receiver shall have LED indicators to provide information regarding the following conditions:
      1) Power On/Off
      2) Ethernet - Receiver Activity/No Activity
      3) Wireless Normal Mode - Transmission from sensors/No Transmission
      4) Wireless Rapid Transmit Mode - No transmission/ weak signal/Adequate signal/Excellent signal
      5) Ethernet Connection - No connection/10Mbps connection/100Mbps connection
      6) Network Activity - No Network Activity/Half-Duplex Communication/Full-Duplex Communication
2. The WRS Sensors shall sense and report room temperatures to the WRS Receiver.
   a. The WRS Sensors shall use direct sequence spread spectrum RF technology.
   b. The WRS Sensors shall operate on the 2.4 GHZ ISM Band.
   c. The WRS Sensors shall meet the IEEE 802.15.4 standard for low-power, low duty-cycle RF transmitting systems.
   d. The WRS sensors shall be FCC compliant to CFR Part 15 subpart B Class A.
   e. The WRS sensors shall be available with
      1) Warmer/Cooler Set Point Adjustment
      2) No Set Point Adjustment
      3) Set Point Adjustment Scale - 55 to 85F.
   f. The WRS sensors shall be assembled in NEMA 1 plastic housings.

2.8 SYSTEM TOOLS

A. System Configuration Tool (SCT)
   1. The Configuration Tool shall be a software package enabling a computer platform to be used as a stand-alone engineering configuration tool for a Network Automation Engine (NAE) or a Network Integration Engine (NIE).
   2. The configuration tool shall provide an archive database for the configuration and application data.
   3. The configuration tool shall have the same look-and-feel at the User Interface (UI) regardless of whether the configuration is being done online or offline.
   4. The configuration tool shall include the following features:
      a. Basic system navigation tree for connected networks
      b. Integration of Metasys N1, LonWorks, and BACnet enabled devices
      c. Customized user navigation trees
      d. Point naming operating parameter setting
      e. Graphic diagram configuration
      f. Alarm and event message routing
      g. Graphical logic connector tool for custom programming
      h. Downloading, uploading, and archiving databases
   5. The configuration tool shall have the capability to automatically discover field devices on connected buses and networks. Automatic discovery shall be available for the following field devices:
      a. BACnet Devices
      b. LonWorks devices
      c. N2 Bus devices
      d. Metasys N1 networks
   6. The configuration tool shall be capable of programming the Field Equipment Controllers.
      a. The configuration tool shall provide the capability to configure, simulate, and commission the Field Equipment Controllers.
      b. The configuration tool shall allow the FECs to be run in Simulation Mode to verify the applications.
      c. The configuration tool shall contain a library of standard applications to be used for configuration.
   7. The configuration tool shall be capable of programming the field devices.
      a. The configuration tool shall provide the capability to configure, simulate, and commission the field devices.
      b. The configuration tool shall allow the field devices to be run in Simulation Mode to verify the applications.
      c. The configuration tool shall contain a library of standard applications to be used for configuration
   8. A wireless access point shall allow a wireless enabled portable PC to make a temporary Ethernet connection to the automation network.
      a. The wireless connection shall allow the PC to access configuration tool through the web browser using the User Interface (UI).
      b. The wireless use of configuration tool shall be the same as a wired connection in every respect.
      c. The wireless connection shall use the Bluetooth Wireless Technology.
   9. Wireless MS/TP Converter (BTCVT)
      a. The converter shall provide a temporary wireless connection between the SA or FC Bus and a wireless enabled portable PC.

b. The converter shall support downloading and troubleshooting FEC and field devices from the PC over the wireless connection.
c. The converter shall employ Bluetooth Wireless Technology.
d. The converter shall be powered through a connection to either the Sensor-Actuator (SA) or the Field Controller (FC) Bus.
e. The converter shall operate over a minimum of thirty three (33) feet within a building.
f. The converter shall have LED indicators to provide information regarding the following conditions:
    1) Power - On/Off
    2) Fault - Fault/No Fault
    3) SA/FC Bus - Bus Activity/ No Bus Activity
    4) Blue - Bluetooth Communication Established/ Bluetooth Communication Not Established
g. The SWCVT shall comply with FCC Part 15.247 regulations for low-power unlicensed transmitters.

10. Handheld VAV Balancing Sensor (ATV)
    a. The sensor shall be a light weight portable device of dimensions not more than 3.2 x 3.2 x 1.0 inches.
    b. The sensor shall be capable of displaying data and setting balancing parameters for VAV control applications.
    c. The sensor shall be powered through a connection to either the Sensor-Actuator (SA) or the Field Controller (FC) Bus.
    d. The sensor shall be a menu driven device that shall modify itself automatically depending upon what type of application resides in the controller.
    e. The sensor shall contain a dial and two buttons to navigate through the menu and to set balancing parameters.
    f. The sensor shall provide an adjustable time-out parameter that will return the controller to normal operation if the balancing operation is aborted or abandoned.
    g. The sensor shall include the following
        1) 5 foot retractable cable
        2) Laminated user guide
        3) Nylon caring case
    h. The sensor shall be Underwriters Laboratory UL 916 listed and CSA certified C22.2 N. 205, CFR47.

PART 3 - EXECUTION

3.1 BAS REQUIREMENTS

A. Graphic Displays
1. Provide a color graphic system flow diagram display for each and every thermal system specified for the project including but not limited to chilled water, hot water, steam, cooling towers, heat pumps, unit heaters, DX units, etc. with all points as indicated on the point list. If equipment controls are furnished with equipment, provide interface connection to equipment controllers so that all points can be seen and be accessible to the BAS on the graphic representation of the equipment. All terminal unit graphic displays shall be from a standard design library. Provide a floor graphic of each area of the building with capability to see temperature and humidity of each space or system and allow penetration to individual heat pumps, VAV boxes, etc. from the graphic floor plan. Each graphic shall display common parameters such as outside air dry bulb and wet bulb temperature, chilled water and hot water supply temperatures, etc.

2. User shall access the various system schematics via a graphical penetration scheme and/or menu selection.
3. Dynamic Color Graphic Displays: Provide color graphic floor plan displays, and system schematics for each piece of mechanical equipment, including air handling units, chilled water systems, hot water systems, and boiler system.
4. System Selection/Penetration: The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection, or text-based commands.
5. Dynamic Data Displays: Dynamic temperature values, humidity values, flow values, and status indication shall be shown in their actual respective locations, and shall automatically update to represent current conditions without operator intervention.

B. Custom Reports:
1. Provide custom reports as required for this project:

C. Actuation / Control Type
1. All damper and valve actuation shall be electric.
2. Air Handling Equipment
   a. All air handlers shall be controlled with a FEC Controller
   b. All damper and valve actuation shall be electric.
3. Terminal Equipment:
   a. Terminal Units (VAV, UV, etc.) shall have electric damper and valve actuation.
   b. All Terminal Units shall be controlled with VMA Controller.

3.2 INSTALLATION

A. BAS Wiring
1. All conduit, wiring, accessories and wiring connections required for the installation of the Building Automation System, as herein specified, shall be provided by the BAS Supplier/Installer unless specifically shown on the Electrical Drawings under Division 16 Electrical. All wiring shall comply with the requirements of applicable portions of Division 16 and all local and national electric codes, unless specified otherwise in this section.
2. All BAS wiring materials and installation methods shall comply with BAS manufacturer recommendations.
3. The sizing, type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the BAS Supplier/Installer. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the BAS Supplier/Installer, the Supplier/Installer shall be responsible for all costs incurred in replacing the selected components.
4. Class 2 Wiring
   a. All Class 2 (24VAC or less) wiring shall be installed in conduit unless otherwise specified.
   b. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5' from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines. All wiring shall be installed in accordance with local code requirements.
5. Class 2 signal wiring and 24VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.
6. Provide for complete grounding of all applicable signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.

B. BAS Line Voltage Power Source
   1. 120-volt AC circuits used for the Building Automation System shall be taken from panel boards and circuit breakers provided by Division 26.
   2. Circuits used for the BAS shall be dedicated to the BAS and shall not be used for any other purposes.
   3. DDC terminal unit controllers may use AC power from motor power circuits.
   4. Each BAS panel shall be provided with a battery powered UPS capable of powering all control functions within the panel and powered from the panel for a minimum period of 15 minutes.

C. BAS Raceway
   1. All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 1/2".
   2. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.
   3. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.
   4. Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls. Flexible Metal Conduit shall be UL listed.

D. Penetrations
   1. Provide UL rated fire stopping for all penetrations used by dedicated BAS conduits and raceways.
   2. All openings in fire proofed or fire stopped components shall be closed by using UL approved fire resistive sealant.
   3. All wiring passing through penetrations, including walls shall be in conduit or enclosed raceway.
   4. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.

E. BAS Identification Standards
   1. Node Identification. All nodes shall be identified by a permanent label fastened to the enclosure. Labels shall be suitable for the node location.

F. Cable types specified in Item A shall be color coded for easy identification and troubleshooting.

G. BAS Panel Installation
   1. The BAS panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.
   2. The BAS Supplier/Installer shall be responsible for coordinating panel locations with other trades including work specified under Divisions 15 and 16.

3.3 TRAINING

A. The BAS Supplier/Installer shall provide the following training services:
   1. One day of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the BAS software layout and naming conventions, and a walk through of the facility to identify panel and device locations.

3.4 COMMISSIONING

A. Fully commission all aspects of the Building Automation System work.

B. Acceptance Check Sheet
   1. Prepare a check sheet that includes all points for all functions of the BAS as indicated on the point list included in this specification.
   2. Submit the check sheet to the Engineer for approval
   3. The Engineer will use the check sheet as the basis for acceptance with the BAS Supplier/Installer.

C. VAV box performance verification and documentation:
   1. The BAS Supplier/Installer shall test each VAV box for operation and correct flow. At each step, after a settling time, box air flows and damper positions will be sampled. Following the tests, a pass/fail report indicating results shall be produced. Possible results are Pass, No change in flow between full open and full close, Reverse operation or Maximum flow not achieved. The report shall be submitted as documentation of the installation.
   2. The BAS Supplier/Installer shall issue a report based on a sampling of the VAV calculated loop performance metrics. The report shall indicate performance criteria, include the count of conforming and non-conforming boxes, list the non-conforming boxes along with their performance data, and shall also include graphical representations of performance.

D. Promptly rectify all listed deficiencies and submit to the Engineer that this has been done.

END OF SECTION

SECTION 23 33 19 - DUCT SILENCERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Duct Silencers.

B. Ductwork Sound Barrier Lagging.

1.2 RELATED REQUIREMENTS

A. Section 23 05 00 - Common Work Results for HVAC

B. Section 23 31 13 - Sheetmetal Ductwork

C. Section 23 33 00 - Air Duct Accessories

D. Section 23 73 13 - Modular Central-Station Air-Handling Units

1.3 REFERENCE STANDARDS

A. AMCA 303 - Application of Sound Power Level Ratings for Fans; Air Movement and Control Association International, Inc.; 2008.

B. AHRI 575 - Method of Measuring Machinery Sound Within an Equipment Space; Air-Conditioning, Heating, and Refrigeration Institute; 2008.

C. ASHRAE Std 68 - Laboratory Method of Testing To Determine the Sound Power in a Duct; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1997.

D. ASTM E477 - Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers; 2013.

E. ASTM E596 - Standard Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures; 2009.

F. ASTM E84 - Standard Test Method for Surface Burning characteristics of Building Materials.

G. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

H. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.

I. UL 723 - Tests for Surface Burning Characteristics of Building Materials; 2003.

1.4 SUBMITTALS

A. Submit product data for review in accordance with the provisions of Division 01 including:
   1. Dimensions and location of each silencer
   2. Independent laboratory certified minimum dynamic insertion loss, self-generated noise, and pressure drop ratings for each silencer.

1.5 CERTIFICATION

A. Silencer ratings shall be certified by nationally known qualified independent testing laboratory. Testing shall be conducted in strict accordance with ASTM E477 method for testing prefabricated silencers for acoustical and airflow performance.

PART 2 - PRODUCTS

2.1 DUCT SILENCERS

A. Acceptable manufacturers: AeroSonics, IAC Acoustics, Industrial Noise Control, Inc., McGill Airflow, SEMCO, Spiral Pipe of Texas (SPOT), Inc., or Vibro-Acoustics.

B. Substitutions: Not permitted.

C. Construct duct silencers in accordance with SMACNA Standards for high pressure duct. Provide air-tight casing when tested to 8" water gauge pressure differential. Suitably stiffen casings to prevent permanent deformation when tested to 8" water gauge pressure differential.

D. Fabricate outer casings of rectangular silencers from minimum 22 gauge galvanized steel.

E. Fabricate outer casings of round silencers from galvanized steel as follows:

Outside Diameter	Minimum Metal Gauge
12" - 26"	24
27" - 36"	22
37" - 50"	20
51" - 60"	18

F. Fabricate interior casings from minimum 26 gauge galvanized perforated steel.

G. Filler material shall be inorganic mineral or glass fiber packed under minimum 5% compression. Filler material shall be vermin and moisture proof and inert. Combustion rating of filler material shall be not more than the following when tested in accordance with NFPA 255, ASTM E84, or UL-723.
   1. Flame Spread: 25
   2. Smoke Development Rating: 50
   3. Fuel Contribution: 20

H. See drawings for size, location, and acoustical and pressure drop performance required for each silencer.

2.2 **DUCTWORK SOUND BARRIER LAGGING**

A. Acceptable Manufacturers:
   1. GLT Products Vinaflex VN-100
   2. Manufacturer's Rubber & Supply VLN

B. Product: 1/8" thick, 1 lb/sf flexible mass loaded vinyl sound barrier.

C. Acoustical property: minimum STC value of 26 as tested by ASTM E-90.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install silencers in accordance with manufacturer's published installation instructions. The duct silencer supplier or his qualified representative to be responsible for providing such supervision as may be required to assure correct and complete installation of the duct silencers.

B. Resiliently isolate silencers from the building construction at points of penetration of the building structure with minimum 1/2" thickness, 3 lb./cubic foot density glass fiber.

C. Support duct silencers independent of ducts with flexible duct connections. Refer to Section 23 3300.

D. Seal multiple silencer units grouped together in parallel airtight with EC-800 sealant as manufactured by 3M Company or approved equal.

E. Where indicated, lag ductwork with mass-loaded vinyl and install in accordance with manufacturer's written instruction.
   1. Cover lagging with specified duct insulation where required.
   2. Seal all duct penetrations for airtight installation.
   3. Reinforce ductwork and supports to carry added lagging weight.

3.2 FIELD QUALITY CONTROL AND TESTING

A. When requested by Owner, provide services of an independent testing agency to take noise measurements in accordance with provisions of NEBB (STDS). Use meters meeting requirements of ANSI S1.4.

B. After start-up, final corrections and balancing of systems take octave band sound measurements over full audio frequency range in areas adjacent to mechanical equipment rooms, duct and pipe shafts, and other critical locations, as directed.

C. Provide one-third octave band measurements of artificial sound sources in areas indicated as having critical requirements.

D. Submit complete report of test results including sound curves.

END OF SECTION 23 33 19

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SECTION 23 64 23 - PACKAGED, AIR COOLED SCROLL CHILLER

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Packaged, air-cooled, electric motor driven scroll chillers.

1.2 RELATED REQUIREMENTS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 05 53 - Identification for HVAC Piping and Equipment.

D. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

E. Section 23 07 00 - HVAC Insulation.

F. Section 23 09 23 - Direct-Digital Control System for HVAC.

G. Section 23 21 13 - HVAC Piping

H. Section 23 21 16 - Hydronic Piping Speciaties

I. Section 23 21 23 - HVAC Pumps

J. Section 23 25 00 - HVAC Water Treatment.

1.3 REFERENCE STANDARDS

A. AHRI 550/590 - Standard for Performance Rating of Water-Chilling Packages Using the Vapor Compression Cycle; Air-Conditioning, Heating, and Refrigeration Institute; 2011.

B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2013 (ANSI/ASHRAE Std 15).

C. ASHRAE Standard 34 - Designation and Classification of Refrigerants; 2010.

D. ASHRAE Std 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2013, Including All Addenda (ANSI/ASHRAE/IES Std 90.1).

E. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2013.

F. IEEE 519 - IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems; Institute of Electrical and Electronic Engineers; 1992 (R 2004).

G. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.

H. UL 984 - Hermetic Refrigerant Motor-Compressors; Underwriters Laboratories Inc; Current Edition, Including All Revisions.

I. UL 1995 - Heating and Cooling Equipment; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

J. NEC - National Electrical Code.

1.4 SUBMITTALS

A. Submit product data and required information in accordance with the provisions of Division 01.

B. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate equipment, piping and connections, valves, strainers, and thermostatic valves required for complete system.

C. Starter characteristics including AIC rating.

1.5 QUALITY ASSURANCE

A. Construction and Ratings: ARI Standard 590/590-2015 and ANSI B9.1 Safety Code.

B. Comply with National Electrical Code and ASME Code.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units from physical damage. Factory coil shipping covers shall be kept in place until installation.

1.7 WARRANTY

A. Provide a two year warranty to include coverage for complete chiller package as manufactured and delivered to site including materials and labor.

B. Provide a five year warranty for replacement of compressors including materials and labor.

1.8 REFRIGERANTS

A. Acceptable refrigerants: R-407C or R-410A.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Daikin Applied, Trane, or York.

B. Substitutions: Not permitted.

2.2 EQUIPMENT DESCRIPTION

A. Factory assembled package: One piece package air-cooled liquid chiller, completely factory charged with refrigerant and arranged for single point electrical connection.

B. Unit shall meet or exceed the minimum energy efficiency requirements of ASHRAE Standard 90.1.

2.3 HOUSING

A. Exterior finish: Galvanized shell, zinc phosphatized, with an electrostatically applied, high solids polyester, baked enamel finish.

B. Unit panels, decorative louvered panels, and control panels shall be finished with baked on enamel finish.

C. Mount starter and disconnects in weatherproof panel provided with full opening access doors. Provide disconnect operating handle external to panel and clearly visible from outside of unit if power is on or off.

2.4 COMPRESSORS

A. Hermetic, direct drive scroll compressors with suction and discharge valves.

B. Statically and dynamically balance rotating parts.

C. Vibration Control: Factory installed internal isolators.

D. Provide oil pump lubrication system with oil charging valve and oil filter to ensure adequate lubrication during starting, stopping and normal operation. Provide operating oil charge.

E. Capacity Reduction System: Compressor staging with control down to 12 percent of full load without the activation of hot gas by-bass.

F. Provide constant speed compressor motor, suction gas cooled with solid state sensor and electronic winding overheating protection.

G. Provide compressor heaters to evaporate refrigerant returning to crankcase during shut down. Energize heater when compressor is not operating.

H. Manual reset required after motor stoppage due to thermal overload.

2.5 COMPRESSOR MOTOR

A. Cooled by suction gas passing around motor winding.

B. Operated and protected against overload by means of a definite-purpose contactors and calibrated, ambient-compensated, magnetic trip circuit breakers.

C. Circuit breakers shall open all phases in event of overload in any one phase and shall require manual reset.

D. Starter: Unit mounted, across-the-line, factory installed, pre-wired in a UL 1995 control panel. Provide with factory wired 820VA, 120v control circuit transformer. Provide with a 65,000 AIC rating on 460V 3 Phase units.

2.6 EVAPORATOR

A. Brazed plate heat exchanger of stainless steel designed for a refrigerant side working pressure of 430 psig and a water side working pressure of 150 psig.

B. Design, test, and stamp refrigerant side for 1.1 times the working pressure and water side for 1.5 times the working pressure.

C. Insulate with 2 layers of 0.75" thick flexible elastomeric rubber closed cell insulation with a maximum "K" factor of 0.28. Provide vapor barrier over insulation consisting of expanded polyvinyl chloride jacket. Provide heat tape and thermostat or immersion heaters to protect evaporator to -20 degrees F.

D. Provide water drain connection, vent and fittings for factory installed leaving water temperature control and low temperature cutout sensors. Provide grooved water piping connections.

E. Provide factory mounted chilled water flow switch.

2.7 **AIR COOLED CONDENSER AND FANS**

A. Air-cooled microchannel condenser coils with all aluminum brazed fin construction. Each slab shall be split horizontally into separate condensing and subcooling coils connected to a copper tube or receiver tank. Factory test and leak test condenser to 715 psig. Maximum working pressure shall be 650 psig.

B. Condenser fans shall be propeller type, corrosion resistant, vertical discharge, statically and dynamically balanced. Provide removable corrosion resistant fan guards over each fan.

C. Condenser fan motors shall be three-phase, totally-enclosed-air-over (TEAO) with permanently lubricated ball bearings with external thermal overload protection.

2.8 REFRIGERANT CIRCUIT

A. Each unit shall have two independent refrigeration circuits.

B. Provide the following for each refrigerant circuit:
   1. Hot-gas muffler.
   2. High side pressure relief device.
   3. Liquid line shutoff valve.
   4. Replaceable-core filter drier.
   5. Moisture indicating sight glass.
   6. Liquid line solenoid valve.
   7. Electronic or thermal expansion valve sized for maximum operating pressure.
   8. Charging valve.
   9. Discharge and oil line check valve.
   10. Compressor discharge service valves.
   11. Full operating charge of refrigerant and oil.
   12. Unit factory leak tested at 200 psig.

2.9 INTEGRATED MICROPROCESSOR BASED DDC CONTROLS PACKAGE

A. Pre-wire, assemble, factory mount, and test operating and safety control system consisting of a digital display or gauges, on-auto-off switch, motor starters, disconnect switches, power and control wiring. Provide controls, monitoring, programmable set-points, alarms, and BAS as defined below:
   1. Automatic Adjustable Operating Controls:
      a. Allow system start-up and system operation at all outdoor air temperatures down to 0 degrees F.
      b. Chilled water supply temperature.
      c. Chiller system capacity control based on set-points and system load.
      d. Compressor short-cycling prevention.
      e. Lead/lag for multiple compressors.
      f. Automatic reset on power source failure.
      g. Load limiting.
      h. Sequencing of condenser fans.
   2. Normal Operation Monitoring and Open Cover-less Displays:
      a. Hours of operation.
      b. Suction and discharge refrigerant pressures.
      c. Automatic diagnostics.
      d. Number of starts.
      e. On/off compressor status.
      f. Entering and leaving chilled water temperatures.
      g. Status of operation.
      h. Weekly purge cycle totalization if applicable.
      i. Oil pressure.
   3. Set-Points:
      a. Chilled water supply temperature.
      b. Date/time.
   4. Automatic Chiller Shut-Down Safety Controls and Alarm:
      a. Automatic Reset:
         1) Chilled water flow interlock.
         2) Voltage protection (over/under).
         3) Phase reversal protection.
      b. Manual Reset:
         1) Evaporator low pressure.
         2) High motor winding temperature.
         3) Low chilled water temperature.
         4) Low chilled water flow.
         5) High condenser refrigerant discharge pressure.
         6) Motor current overload and phase loss.
         7) Low oil flow.
      c. Remote Alarm: Activate remote, audible bell upon safety shutdown of chiller.
   5. Building Automation System (BAS) Communications via Shielded Cable:
      a. Minimum Data Transmission to BAS:
         1) All system operating conditions.
         2) Capacity control information.
         3) Safety shutdown conditions.
      b. Minimum Operating Commands from BAS:
         1) Remote unit start/stop.

2) Remote chilled water reset.

PART 3 - EXECUTION

3.1 MANUFACTURER'S FIELD SERVICES

A. Furnish the services of a trained representative to for a period of two days to supervise installation, testing, dehydration and charging, start-up and instruction of maintenance personnel.

B. Furnish a signed statement, on completion of the project, that the chillers are properly installed and operating correctly.

3.2 INSTALLATION

A. Install the chillers in accordance with the manufacturer's installation instructions.

B. Align chiller package on steel foundation or concrete housekeeping pad.

C. Install interconnecting piping, valves, fittings as required for a complete operating system.

D. Install piping for easy dismantling to permit tube cleaning.

E. Provide electrical connections under Division 26.

END OF SECTION 23 64 23

SECTION 23 73 13 - MODULAR INDOOR CENTRAL-STATION AIR HANDLING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Factory fabricated, modular construction, indoor air handling units with internal components including fans with belt or direct drives, heating and cooling coils, filter racks, access doors, and lights.

B. Refer to drawings for additional required components and configuration of air handling unit(s).

1.2 RELATED REQUIREMENTS

A. Section 23 05 00 - Common Work Results for HVAC.

B. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

C. Section 23 05 23 - General Duty Valves for HVAC.

D. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

E. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

F. Section 23 07 00 - HVAC Insulation.

G. Section 23 09 23 - Building Automation and Direct Digital Controls.

H. Section 23 21 13 - HVAC Piping.

I. Section 23 21 16 - Hydronic Piping Specialties.

J. Section 23 31 13 - Sheetmetal Ductwork.

K. Section 23 33 00 - Air Duct Accessories.

L. Section 23 41 00 - Particulate Air Filtration.

M. Section 26 29 23 - Variable Frequency Motor Controllers.

1.3 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.4 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; American Bearing Manufacturers Association, Inc.; 1990 (Reapproved 2008).

B. ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings; American Bearing Manufacturers Association, Inc.; 2014.

C. AHRI 260 - Sound Rating of Ducted Air Moving and Conditioning Equipment; 2011.

D. AHRI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils; Air-Conditioning, Heating, and Refrigeration Institute; 2001 (R2011).

E. AHRI 430 - Standard for Central-Station Air-Handling Units; Air-Conditioning, Heating, and Refrigeration Institute; 2009.

F. ANSI/AHRI Standard 1350 - Mechanical Performance Rating of Central Station Air-Handling Unit Casings; 2014 edition.

G. ANSI/ASHRAE Standard 111-2008; Measurement, Testing, Adjusting and Balancing of Building HVAC Systems

H. ASHRAE Std 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013, Including All Addenda (ANSI/ASHRAE/IES Std 90.1).

I. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.

J. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2012.

L. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current edition, including all revisions.

M. UL 795 - Commercial-Industrial Gas Heating Equipment; Current Edition, Including All Revisions.

1.5 SUBMITTALS

A. Submit Product Data in accordance with the requirements of Division 01, including but not limited to:
   1. Published literature: Indicate dimensions, weights, capacities, ratings, gauges and finishes of materials, and electrical characteristics and connection requirements.
   2. Filter frames provided by unit manufacturer. Filter data shall be submitted as specified in Section 23 41 00.
   3. Fan curves shall include entire range of RPM curves, scheduled operating point clearly plotted, motor brake horsepower, and motor horsepower.
   4. Sound power level data: Fan outlet, inlet and casing radiation at rated capacity.
   5. Electrical requirements: Power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

B. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

C. Indicate location of factory installed or field mounted control devices.

1.6 QUALITY ASSURANCE

A. Certify unit components in accordance with AHRI Standard 430 as applicable.

B. Certify coils in accordance with AHRI Standard 410. Substantiate performance by AHRI computer generated output.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

C. Do not operate units until ductwork is clean, all scheduled/specified filters are in place, bearings lubricated, and fans have been test run under observation.

1.8 WARRANTY

A. The equipment manufacturer shall warrant parts and workmanship for one year from the date of substantial completion, or 18 months from equipment shipment.

B. During this warranty period, the manufacturer will provide replacement parts as required to return the unit to operation.

C. Warranty covers all parts except consumable items (belts, filters, fuses) for the warranty period.

D. Contractor shall provide all labor and parts necessary during the warranty period.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Daikin Applied, Trane, Temtrol, or York.

B. Substitutions: Refer to Division 01.

2.2 GENERAL

A. Fabricate air handling units suitable for the scheduled air pressure operation.

B. Fabricate units with fan section, coil sections and access sections per the configurations shown on the mechanical plans and schedules.

C. Factory fabricate and test air handling units of sizes, capacities, and configuration as indicated and specified. Units shall be fully assembled on scheduled height base rail (6 inch minimum) up to practical shipping limitations. On units not shipped fully assembled, manufacturer shall tag each section to indicate location in direction of airflow to facilitate assembly at the job site.

D. The vendor and Contractor shall closely coordinate section splits and dimensions to accommodate the constraints involved with getting equipment into and out of mechanical rooms, areaways, building corridors, and interior/exterior doors to the building.

2.3 CASING

A. Unit shall be double wall constructed in all sections.
   1. Exterior wall shall be minimum 18 gauge galvanized steel. Interior wall shall be minimum 20 gauge solid galvanized steel. Construction shall contain thermal breaks between all interior and exterior steel surfaces.
   2. All portions of the interior of the unit exposed to the airstream shall be covered with steel to allow cleaning and prevent fiberglass erosion into the airstream. Foil facing on insulation shall not be acceptable as a substitute for double wall construction.
   3. Insulate all sections of air handling unit with 2" thick, 3 lb (R8) matt faced fiberglass between two sheets of solid galvanized steel. Completely fill all panel cavities in all directions preventing voids and settling.

B. Units with welds on exterior surfaces or welds that have burned through from interior welds shall also receive a final shop coat of zinc-rich protective paint in manufacturer's standard color.

C. Unit shall be designed and constructed such that all exterior panels are non-load bearing. Removal of all exterior panels shall not affect the structural integrity of the unit.

D. Casing deflection shall meet or exceed Class D3 of 0.0042 in/in of span at 6" w.c. static pressure differential.

E. Unit casing shall meet or exceed Leakage Class 6 positive pressure and Class 3 negative pressure as based on the SMACNA test method and calculated as noted in ASHRAE Std 111 and AHRI 1350. Unit manufacturer shall provide test data confirming cabinet construction meets these requirements.

F. Units shall have internally mounted motor and drives. Unit shall include a totally enclosed belt guard over drive components to prevent possible injury. Belt guard shall be provided with tachometer holes to facilitate RPM readings of the fan.

G. Bottom Inlet/Outlet Units: Provide steel or aluminum walking grate on structural supports.

2.4 MIXING SECTION

A. Provide a functional section to support the damper assembly for modulating the volume of outdoor and return air as shown on the drawings.

B. Damper Blades:
   1. Provide airfoil or V-groove design, compressible jamb seals and extruded-vinyl blade-edge seals on all blades.
   2. Self-lubricating stainless steel or synthetic sleeve bearings.
   3. Comply with ASHRAE 90.1 for rated maximum leakage rate.
   4. Base all leakage testing and pressure ratings on AMCA 500-D.
   5. Arrange in parallel or opposed blade configuration.

2.5 FILTER SECTIONS

A. Supply filter section complete with galvanized steel filter racks as integral part of unit. Filters to be accessible from both sides of unit unless noted otherwise.

B. Filter sizes and types to be as specified on drawings. Refer to Section 23 41 00 for filter specifications and additional requirements.

2.6 COILS

A. Coils shall be manufactured by the same company as the supplier of the air handling unit except for integral face and bypass (IFB) preheat coils that shall be manufactured by L.J. Wing and factory installed in the air handling units. Coils shall be designed with aluminum plate fins and copper tubes.

B. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion of the tubes. No soldering or tinning shall be used in the bonding process. Coils shall be mounted in the unit casing to be accessible for service and can be removed from the unit either through the side or top. Capacities, pressure drops and selection procedure shall be certified in accordance with AHRI Standard 410.

C. Provide factory installed extended drain and vent connections for water coils.

D. Hydronic coils shall have copper or red brass coil connectors to match pipe specified connection material. For coil connections 2-1/2 " and larger provide black steel connections to match pipe specification. Where dissimiliar pipe materials are used, provide dielectric pipe transition unions or flanges.

E. For stacked coils, the lower coil must be removable from the unit without removing the upper coil(s). Provide an internal stacking rack for the coil section if removable lower coils are not an available unit option. Intermediate drain pans for stacked coils shall be insulated.

F. Water Cooling Coils
   1. All coils shall be enclosed in an insulated coil section. Coil headers and U-bends shall not be exposed.
   2. Waterflow shall be counter to airflow.
   3. Coils shall be proof tested to 300 psig and leak tested to 200 psig air pressure under water.
   4. Headers shall be round copper pipe or red brass.
   5. Tubes shall be 1/2" or 5/8" OD.
   6. Headers shall have PT plug connections on inlet and outlet connections.
   7. Piping connections shall be extended out the side of the unit and capped.
   8. Provide stainless steel supports, fasteners and end plate blankoffs.

G. Water Heating Coils
   1. All coils shall be enclosed in a coil section. Coil headers and U-bends shall not be exposed.
   2. Waterflow shall be counter to airflow.
   3. Coils shall have a supply header to ensure distribution of hot water to each tube of coil.
   4. Coils shall be proof tested to 300 psig and leak tested to 200 psig, air pressure under water.
   5. Tubes shall be 1/2" or 5/8" OD thick.

6. Headers shall have PT plug connections on inlet and outlet connections.
7. Headers shall be round copper pipe. Cast iron headers are prohibited.
8. Piping connections shall be extended out the side of the unit and capped.

2.7 DRAIN PANS

A. Provide cooling coil sections with an insulated, double wall, stainless steel drain pan complying with ASHRAE 62.1 for indoor air quality and sufficiently sized to collect all condensate. Drain pan shall extend under the entire width of the coil module and extend a minimum of 24 inches beyond the leaving face of the coil. A drain pan shall be provided under the complete supply fan section for draw-thru configuration units.

B. An intermediate condensate drip pan shall be provided on all coils over 48 inches high and the intermediate drip pan shall extend a minimum of 6 inches in the downstream direction of the airflow. Each intermediate drain pan shall be piped to within 2 inches of the bottom drain pan

C. Slope in two planes to promote positive drainage. Locate outlet of sufficient diameter at lowest point of pan to prevent standing water under normal operating conditions.

D. Provide threaded drain connections constructed of drain pan material, extended sufficient distance beyond the base to accommodate field installed, condensate drain trapping.

2.8 SUPPLY FAN SECTION

A. Provide supply fan section with double width, double inlet centrifugal fan, plenum fan, mixed flow fan, or as designated on Drawings, designed and suitable for class of service indicated in the unit schedule. Centrifugal fan wheels shall be airfoil, backward inclined or forward curved as scheduled. Fan shaft to be properly sized and protectively coated with lubricating oil. Fan shafts shall be solid and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. Fans shall be statically and dynamically tested as an assembly at the required RPM to meet design specifications. Fan wheel shall be properly secured to shaft to prevent slippage.

B. Provide self-aligning, grease lubricated pillow-block ball bearings with lubrication fittings. All bearings shall perform to L-50, 200,000 hour average life.

C. Provide extended grease lines to drive side of unit casing if required for access for all fan bearings. Rigidly attach zerk fittings to unit casing for easy service access. If extended grease lines are not provided, unit shall include an opposite drive side access door and service room must be allowed on the opposite side of the unit to perform regular maintenance.

D. Fan, motor and drive shall be internally isolated with 2" deflection spring isolators with seismic restrained housings.

E. Provide internal factory mounted canvas duct connection at fan discharge connection to fan module.

2.9 FAN-WALL ARRAY

A. General
1. Provide a complete fan-wall array consisting of multiple, matching, direct driven, arrangement 4 plenum fans with fan wheels that are rated and certified with tests and procedures in accordance with AMCA publication 211 and comply with the requirements of

the AMCA Certified Ratings Program. All fans shall be selected to deliver the specified airflow quantity at the specified total static pressure and specified fan/motor speed with the loss of a single fan/motor. The fan-wall array shall be selected to operate at a system total static pressure that does not exceed 90% of the specified fan's peak static pressure producing capability at the specified fan/motor speed. Each fan/motor "cube" shall include a 12 gauge, G 90U Galvanized steel intake wall, 16 gauge spun steel fan inlet funnel, and a 1/4" steel motor support plate rail and structure. The fan intake wall, inlet funnel, and motor support structure shall be powder coated for corrosion resistance.

2. The fan-wall array shall be spaced in the airway tunnel cross section to provide a uniform airflow and velocity profile across the entire airway tunnel cross section and components contained immediately upstream and downstream. The fan-wall array shall not exceed the specified maximum coil and filter bank face velocity when measured at a point 12" from the intake side of the array and 48" from the discharge side of the array.
3. Each fan/motor assembly shall be removable through a 30" wide access door located on the each side the AHU fan section.
4. Provide a structural beam at the ceiing of the fan section sized for the weight of each fan/motor/base sections to faciitate removal.
5. Provide a Backdraft damper on each fan to prevent re-circulation through disabled fans and motors with near zero net system effect.
6. Provide one complete spare fan/motor assembly for each size of assembly provided on the project for emergency replacement.

B. Motors
1. Motors shall be approved for use in a fan-wall array arrangement by the motor manufacturer.
2. Refer to Section 23 05 13 for additional motor requirements.
3. All interior wiring serving motors shall be in conduit.

C. Drives and Controls
1. Provide a programmable logic controller (PLC) to locally control all the functions of the fan-wall array. The PLC shall control auto and manual functions, provide airflow totalizing control, optimization control, and all functions required by the fan-wall system. Provide an operator interface unit for communication with the PLC. At a minimum, the system shall be capable of auto start/stop, manual start/stop, safety shutdown, and fire alarm shutdown. The PLC shall be mounted in a dedicated enclosure for connection to single point power and shall include a main disconnecting means. Provide cooling fans within the enclosure as required.
2. Optimization control shall be achieved by enabling and disabling fans in the active array while the controller varies the enabled fan operating speeds to achieve peak operating efficiency at the concurrent system flow and pressure demands of the system.
3. Provide compatible BAS communication interface, BACnet or equal, for input/output control setpoints, alarms, individual on/off fan status, and as otherwise indicated in the control sequence of operation. Confirm protocol with BAS system new or existing.

2.10 MOTORS AND DRIVES

A. Fan motors to be mounted and isolated on the same integral base as the fan.

B. Fan motors shall be heavy duty, premium efficiency open drip-proof. See Section 23 05 13. Furnish "VFD Duty" rated motor for units with variable speed motor controllers.

C. Factory Mount Fan Drives: Make final alignment and belt adjustment after installation. Design drive for 1.4 service factor.

1. For motors up to and including 15 hp, provide variable pitch drives. For motors above 15 hp, provide a variable and a fixed pitch drive. Factory mount the variable pitch drive at the factory and ship unit. After final test and balance of system and fan RPM has been determined, ship properly sized fixed pitch drive and replace the variable pitch drive with the fixed pitch. Turn over removed variable pitch drives to the Owner.

D. Locate fan motor on the access door side of the fan unless access doors are located on both sides of the fan section.

E. When using variable frequency drives provide an AEGIS SGR or approved equal shaft grounding system for each AC motor to prevent electrical damage to motor bearings and to extend motor life by safely channeling harmful shaft currents to ground. The AEGIS SGR system shall be installed by sliding a ring over the end of the motor shaft and locking it in place with screw on mounting brackets. The grounding system shall be frictionless and require no maintenance or additional service during the life of the motor

2.11 DIFFUSER SECTION

A. Provide diffuser section immediately after fan section.

B. Diffuser shall provide uniform airflow distribution across the face of components immediately downstream and not exceeding the maximum specified air velocity across downstream components.

2.12 ACCESS SECTIONS

A. Access sections shall be supplied as specified herein and between unit sections as shown on Drawings. Access doors shall be provided on one the same side of the unit for each access section unless noted otherwise. Doors shall be full height, thermally broken and constructed equal to unit casing as specified above with a minimum access section length of 24 inches unless noted otherwise. Doors shall contain a continuous gasket on all sides and include minimum 8" square reinforced safety glass viewing windows.

B. Provide Ventlok type handles on access doors designed to seal door gasket against frame and operable from both the interior and exterior of the unit. Doors shall be hinged and swing open against pressure unless noted otherwise.

C. On units over 7 feet tall, ganged/interlocked access door latches may be used.

2.13 ACCESSORIES

A. Ultraviolet Lights
   1. Refer to section 23 44 13 for UV light specifications. Provide UV light(s) to shine on the wetted side of the chilled water coil.
   2. Factory assemble and test all UV-C fixtures in the air handling unit. AHU manufacturer shall perform irradiance testing on the equipment using a qualified Nationally Recognized Testing Laboratory (NRTL), such as UL.
   3. Treat view port and other windows to assure the UV-C energy emitted is below the threshold limit specified by American Conference of Governmental Industrial Hygienists (ACGIH) and UL 1995, 5th Edition.
      a. Provide a mechanical interlock switch to disconnect power to the UV-C fixtures when the opening of an access door may pose an exposure risk to UV-C light.

b. Provide externally mounted disconnect switch with lockout/tagout that disconnects UV-C power and prevents unwanted operation of UV-C lights.
c. Provide marking on a interlocking access doors with the words "WARNING UV LIGHT SOURCE".
d. Enclosure doors, covers and access panels, when accessed, shall have no UV-C irradiance greater than 1.7 microWatts per centimeter squared.
e. Irradiance in the occupancy or space around the air handling unit shall not exceed 0.1 microWatts per centimeter squared.

4. No plastic components shall be used. Wiring insulation and connectors shall be UV resistant or contained in metal conduit.

B. Marine Lights: Provide factory mounted, water and dust resistant fluorescent or LED marine observation lights in all access, intake, discharge, and fan sections. Marine lights shall be prewired in conduit to a single timer switch located on the exterior of the module adjacent to the access door. Switches shall be factory mounted complete with outlet box for wiring connection by Division 26 and switch face plate. One switch shall control all lights within the unit.

2.14 ELECTRICAL

A. Wire and test unit at factory before shipment. Comply with NEC requirements and conform with applicable U.L. Standards. Number code wiring per electrical wiring diagrams. Label electrical components according to electrical diagram.

B. Provide 120 volt control circuit transformer and 120 volt convenience receptacle located on the access door side of the unit near the light switch.

C. Route all wiring in rigid conduit or EMT and fasten to unit interior wall.

D. Provide main control panel in an enclosed housing with a dead front cover over the main power circuit controls. Provide terminal blocks for main power connection and low voltage control wiring as required.

E. Provide disconnect switch to disable power before control panel door can be opened.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Rigidly install A/C unit modules and base rails on a concrete curb of sufficient height to install properly sized condensate drain and to allow gravity steam condensate flow from the preheat coil to the condensate pump.

B. For units requiring shipping splits, align and seal unit modules per manufacturer's instructions to prevent leakage.

C. Provide clearance at each unit for routine service including the changing of filters, removal of coils, bearing greasing, opening of access doors, pulling of blower shaft, and removal of motors.

D. Ductwork: Duct connectors to each unit to allow for straight and smooth air flow. Do not install turns at the fan discharge which are in the opposite direction to fan wheel rotation.

E. Provide flexible connections at all duct connections to unit.

F. Piping:
   1. Support piping independently of coils and with adequate flexibility to prevent undue stress at coil header connections.
   2. Install full size drain lines from the drain pan connection and include trap to permit condensate to drain freely. Route drain piping to nearest floor drain and turn down. Provide minimum 1" air gap between the drain piping and floor drain cover to allow drain cover to be removed.
   3. Install service valves on both supply and return lines to coils and install so valves can be shut off, a small section of pipe removed, and coil allowed to slide out.

3.2 MAINTENANCE MATERIALS

A. Furnish the following for Owner's Use:
   1. Extra Fan Belts: One set for each unit.

3.3 START-UP, TESTING, TRAINING

A. Start-up unit, check for proper performance, motor rotation, air leakage, or infiltration, etc.

B. Prepare unit for test and balance as required under Section 23 05 93.

C. Correct deficiencies found by test and balance firm.

D. Demonstrate and instruct maintenance personnel in the operation of the system.

E. Provide start-up paperwork in installation and operation manuals.

3.4 AIR MOVING EQUIPMENT OPERATION DURING CONSTRUCTION

A. The use of air handling units, fans, or other permanent air moving equipment during construction is prohibited unless approved by the owner. If approved for use during construction, the following procedures shall be followed:
   1. The contractor shall protect the interior of all ductwork, air handling units, and other equipment from the accumulation of dirt and dust and other contaminants. If the permanent equipment cannot be adequately protected, temporary air moving/ conditioning equipment and distribution systems shall be utilized as required for finishing trades.
   2. Provide temporary filters on all return and exhaust air grilles, open ductwork, and transfer openings in the work area.
   3. The contractor shall remove all filters used during construction and replace them with new filters prior to test and balance work and prior to substantial completion.
   4. If the ductwork and/or equipment is found to be contaminated at any point during construction, an independent NADCA certified contractor shall be retained to clean the ductwork and/or equipment at the contractors expense. Refer to Section 23 01 30.51.
   5. System operating temperatures shall be maintained to avoid condensation on ductwork and equipment surfaces. New or existing insulation found damaged shall be replaced.

B. Coordinate use of air handling equipment with ICRA plan, if applicable. Maintain required pressure relationships in construction areas adjacent to occupied areas.

END OF SECTION 23 73 13

SECTION 28 23 13 - CLINICAL VIDEO OBSERVATION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Video management software and camera licenses
2. <CONFIRM IF REQUIRED> Network video recorder servers and storage arrays
3. <CONFIRM IF REQUIRED> Network switches for security devices
4. Network video cameras
5. Surge protection devices
6. <CONFIRM IF REQUIRED> Integration with the access control system

B. Related products provided under another Section:
1. 120V power
2. Conduit, junction boxes, and metallic raceways
3. Horizontal UTP cabling for network cameras

C. Related Sections:
1. <CONFIRM SECTION #> Section 27 15 13 - Communications Horizontal Copper Cabling
2. <CONFIRM IF REQUIRED> Section 28 05 33 - Security Network Equipment

1.2 SUBMITTALS

A. Comply with the submittal procedures of Section 28 05 00 - Common Work Results for Electronic Safety and Security Systems.

B. Submittal requirements:
1. Product Data Brochures
2. Shop Drawings
3. <CONFIRM IF REQUIRED> Video Storage and Hardware Calculations:
   a. Include system descriptions, analyses, and calculations used in sizing equipment specified. Descriptions and calculations shall show how the equipment will operate as a system to meet the performance of this specification.
   b. The calculations shall identify:
      1) Camera model
      2) Quantity
      3) Communication protocol (ONVIF, PSIA, etc.)
      4) Compression format (MJPEG, MPEG4, or H.264)
      5) Resolution
      6) Frames per Second
      7) Bitrate
      8) Percentage of motion (if not required to be continuous)
      9) Number of days to record (minimum of 30)
      10) Storage requirement
      11) Server requirement
      12) Estimated bandwidth
      13) Estimated capacity to support future cameras
4. Record Drawings

1.3 SYSTEM DESCRIPTION

A. General:
   1. The intent of this document is to provide all pertinent information to allow the contractor to bid the labor, supervision, tooling, and miscellaneous consumables to provide a complete clinical observation video system. It is the responsibility of the contractor to include any and all items required for a complete system if not identified in these specifications or drawings.

B. Overview:
   1. Patient observation cameras within patient rooms and other areas throughout the <ENTER LOCATION> will be monitored at the nurse station. Recording of patient room cameras is not required.
   2. <IF USING OWNER'S LAN> Cameras will be served by Owner provided network switches in the Telecommunications Rooms and utilize the Owner's LAN to communicate with the network video recording servers in the <ENTER LOCATION> for local video storage.
   3. <IF USING CONTRACTOR PROVIDED LAN> Cameras will be served by network switches in the Telecommunications Rooms and utilize a dedicated Security LAN to communicate with the network video recording servers in the <ENTER LOCATION> for local video storage. Refer to Section 28 05 33 - Security Network Equipment for additional requirements.
   4. Cabling for the network cameras will be provided by under Section 27 15 13 - Communications Horizontal Copper Cabling. <CONFIRM SECTION #>

C. Scope of Work:
   1. Provide video management software with associated license fees to support the cameras and devices shown on the project drawings.
   2. <CONFIRM IF REQUIRED> <REVIEW RECORDING PARAMENTERS WITH OWNER PRIOR TO SPECIFICATION> Provide network video recording (NVR) servers with the following parameters:
      a. 1 fps continuous recording at 1920 x 1080 resolution
      b. 30 fps event recording at 1920 x 1080 resolution (assume 30 % motion activity) with 2-3 second pre/post recording
      c. 30 days of video storage
   3. <CONFIRM IF REQUIRED> Provide rack-mounted UPS and KVM console.
   4. <CONFIRM IF REQUIRED> Provide security workstations shown on project drawings.
   5. Provide clinical observation cameras as shown on project drawings. Cameras mounted within patient rooms to utilize an embedded infrared illuminator and vandal resistant housing.

D. <CONFIRM IF REQUIRED> Interface with Ligature Alarm System
   1. Coordinate with door hardware contractor for ligature alarm system to provide a double-throw contact switch for alarm status at each door.
   2. Provide hardwired point-to-point connection between patient room camera and door alarm as shown on project drawings.
   3. Activation of the ligature alarm system allows an alarm to also occur on the associated camera. Video from this camera is brought to the forefront of the clinical observation monitors in the <ENTER LOCATION>.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. General
1. It shall be the Contractor's burden to prove that any manufacturer other than the ones listed for each product meet or exceed that sections requirements, if submitted.
2. This specification is based on <MANUFACTURER NAME, SOFTWARE NAME AND VERSION NUMBER (i.e. Milestone's XProtect Corporate 2018 R2)> video management software - the most current software provided by <MANUFACTURER NAME> at the time of this specification's publication. Provide the latest release of electronic hardware and software at the time of installation. Using older versions of software and materials must be approved in writing by the Owner.

2.2 VIDEO MANAGEMENT SOFTWARE

A. Application: Software-that provides remote video monitoring and management of clinical observation cameras.

B. Video Management Software:
1. General:
a. Open architecture software platform that supports Microsoft Windows Server 2012 and 2016. Client component supports Microsoft Windows 8 and 10 operating systems for workstations.
b. Supports Active Directory, single sign-on, and capable of running on a Microsoft Windows Workgroup environment.
c. Capable of being installed in a virtual environment using industry leading standards, such as VMware.
d. Software is hardware agnostic and supports commercial off-the-shelf servers (COTS) and storage attachments.
2. Interfaces:
a. Supports network cameras using the ONVIF communication protocol and from multiple third-party manufacturer's using H.264, MPEG-4, and MJPEG video compression.
b. Supports desktop, browser, and mobile web clients. Capable of pushing live video on-demand to and from any client.
c. Supports unicast and multicast video streaming.
d. Supports native motion detection that can be executed at the edge device (encoder or network camera).
e. Supports multi-channel audio recording.
3. Video Recording:
a. Capable of performing multiple tasks simultaneously, and within practical limits, no task shall interfere with any other task.
b. Supports continuous recording, scheduled recording, and event-based recording (motion, alarms, video analytics, etc.) with the ability to augment the video recording parameters per camera upon such events.
c. Capable of recording native video in the following resolutions and format:
1) SVGA (800 x 600)
2) HDTV 720P (1280 x 720)
3) 1.3 MP (1280 x 960)
4) HDTV 1080P (1920 x 1080)

5) WUXGA (1920 x1200)
6) 3 MP (2048 x 1536)
7) 5 MP (2592 x 1944)

d. Capable of performing the following tasks simultaneously:
1) Digitizing and compressing video, and calculating digital signatures for video authentication.
2) Writing video to files on local hard disks, and maintaining an accurate index of the stored video files.
3) Deleting older video files as needed, freeing up space to record newer video files.
4) Selectively transferring recorded video to long-term storage media.

4. Features:
a. Supports dynamic maps with hyperlinks to other maps to create a hierarchy of interlinked files.
b. Includes hardware and bandwidth utilization for monitoring and recording video at different frame rates and resolutions.
c. Provides audit trails of activities and actions performed in the system.
d. Supports multiple configurable windows supporting the following simultaneous functions:
1) Viewing live and recorded video within multiple windows
2) PTZ camera control
3) Export video to digital media devices (CD, etc.)
4) Time synchronized playback
5) Sequential views of predefined areas (guard tours)
e. <CONFIRM IF REQUIRED> Supports up to 4 monitors per client workstation. Each monitor can be individually configured to allow users to open, move, and size multiple video windows. Monitor layouts can be saved by operator logon.
f. Capable of restricting individual functions within client software by operator level.
g. Search capabilities:
1) Motion detection time line
2) Auto-generated time intervals with thumbnail image previews
3) Object or zone based search
4) Alarm event via access control system or video analytic behaviors

C. <BELOW ARE EXAMPLES OF COMMON PLATFORMS, INCLUDE MANUFACTURER AND PRODUCT NUMBERS AS SPECIFIC TO PROJECT> Manufacturers:
1. Milestone
a. #XPCOBT, “XProtect Corporate” video management software base license
b. #XPCODL, “XProtect Corporate” single camera license
2. OnSSI
a. #OC-ULT-B, “Ocularis Ultimate” video management software base license
b. #OC-ULT-1C, “Ocularis Ultimate” single camera license
3. Or equal

2.3 <CONFIRM IF REQUIRED> NETWORK VIDEO RECORDER (NVR) SERVERS

A. Application: Dedicated servers for network video recording.

B. Document the cost of these devices at time of bid due to advancements in technology. Prior to product order, provide upgrades to the latest model as recommended by the video management software manufacturer up to the cost of the specified system.

C. Network Video Recording Server:
   1. Processor: 2 x Intel Xeon Gold series
   2. Memory: 16GB RDIMM
   3. Hard drive configuration: RAID 6
   4. Hard drives: Supports up to 8 x 8TB 7.2K, total size dependent on project
   5. OS: Windows Server 2016 (or most current version supported by manufacturer)
   6. Network adapter: 4 x 1GbE
   7. Power supply: Redundant hot swappable power supplies

D. Manufacturers:
   1. Dell
      a. #R540, “PowerEdge” rack mounted server, 2U, RAID 6
   2. Or equal

2.4 <CONFIRM IF REQUIRED> KVM CONSOLE

A. Application: LCD console with integrated KVM switch in a rack-mount configuration.

B. KVM Console:
   1. Display Type: 17” LCD 1280 x 1024, active-matrix color
   2. Inputs: Keyboard, touchpad
   3. KVM Connections: 16 x keyboard, video, monitor
   4. Power: 100-240V auto-switching power supply
   5. Size: 1U

C. Manufacturers:
   1. APC
      a. #AP5816, 17” LCD rack console with integrated 16-port KVM switch, 1U
      b. #AP5822, KVM USB patch cable, 3.0m
   2. Or equal

2.5 <CONFIRM IF REQUIRED> UNINTERRUPTABLE POWER SUPPLY

A. Application: Provides high density, double-conversion on-line power protection with scalable runtime.

B. UPS:
   1. Input Power: 208V
   2. Input Power Connections: 1 x NEMA L6-30P
   3. Output Power: 208V
   4. Output Power Capacity: 4.25 KWatts (5 kVA)
   5. Output Power Connections:
      a. 2 x NEMA L6-20R
      b. 2 x NEMA L6-30R
   6. Battery Capacity: 840 ampere hour
   7. Size: 5.1”H x 17”W, 3U
   8. Finish: Black

C. Manufacturer:
   1. APC

a. #SRT5KRMXLT, “Smart UPS” series rack-mounted uninterruptable power supply, 5 kVA, 3U
2. Or equal

2.6 <CONFIRM IF REQUIRED> SECURITY WORKSTATIONS

A. Application: Dedicated workstation to view and control video surveillance system.

B. Document the cost of these devices at time of bid due to advancements in technology. Prior to product order, provide upgrades to the latest model as recommended by the video manufacturers up to the cost of the specified system.

C. Security Workstations:
1. Processor: Intel Core i7-8700 series
2. Memory: 16 GB DDR4
3. Hard drives: 250GB
4. OS: Windows 10 Pro (or most current version supported by the manufacturer)
5. Video: AMD Radeon HD R9 360 2GB
6. Network adapter: 1 GbE

D. Security Monitors:
1. Size: 24”
2. Inputs: DisplayPort, HDMI, VGA
3. Resolution: 2560 x 1440
4. Contrast Ratio: 1000:1 typical, 2M:1 dynamic

E. Manufacturers:
1. Dell
a. #Inspiron desktop
b. #P2416D, 24” monitor, 2560 x 1440 resolution
2. Or equal

2.7 NETWORK FIXED CAMERAS - INTERIOR

A. Application: Fixed IP-cameras capable of providing a HDTV 1080p resolution in an interior mini-dome housing.

B. Network Fixed Cameras:
1. Camera:
a. Image sensor: Progressive scan CMOS 1/3” sensor
b. Lens: Varifocal 3.0 - 10.5mm F1.4, remote focus and zoom, IR corrected, P-Iris control, megapixel resolution
c. Day/Night: Automatic, removable IR cut filter
d. Illumination: Color 0.16 lux F1.4, B/W 0.03 lux F1.4
e. Dynamic Range: Equivalent to 120 dB
f. Shutter Speed: 1/66,500 s to 1/1 s
g. Horizontal Viewing Angle: 92 to 34 degrees
h. Vertical Viewing Angle: 50 to 20 degrees
2. Video:
a. Video compression: H.264 high, main, and baseline profile
b. Frame rate and resolution: 60fps in 1920 x 1080

c. Streaming: Multiple, individually configurable streams in H.264 with controllable frame rate and bandwidth.
d. Settings: Wide dynamic range (WDR), remote back focus, remote zoom, backlight compensation, compression, color, contrast, white balance, exposure control

3. Network:
   a. Security: Password protection, IP address filtering, HTTPS encryption
   b. Supported protocols: IPv4 and IPv6, HTTP and HTTPS, SSL/TLS
   c. Application platform: ONVIF profile S and G
4. Interface:
   a. Network Port: RJ-45, 100BASE-TX
   b. Card Slot: SD x 1
5. General:
   a. Casing: IP52 rated, IK-08 impact-resistant, polycarbonate casing with hard-coated dome and dehumidifying membrane
   b. Power: Power over Ethernet IEEE 802.3af Class 3, max 10.2 W

C. Manufacturers:
1. Axis
   a. #0952-001, “P3225-V Mk II” network camera, 1080p resolution, interior model
   b. #01155-001, “T94K02L” drop ceiling kit for P-series cameras
2. Or equal

2.8 <CONFIRM IF REQUIRED> NETWORK PANORAMIC CAMERAS

A. Application: Fixed IP-cameras capable of providing a 5MP resolution in a 360-degree panoramic view.

B. Network Fixed Cameras:
1. Camera:
   a. Image sensor: Progressive scan CMOS 1/1.3.2” sensor, IR corrected, 5MP
   b. Lens: Fixed iris, fixed focus, 1.27mm F2.0
   c. Illumination: Color 0.35 lux F2.0, B/W 0.06 lux F2.0
   d. Shutter Speed: 1/24,500 s to 2 s
   e. Horizontal Viewing Angle: 187 degrees
   f. Vertical Viewing Angle: 168 degrees
2. Video:
   a. Video compression: H.264 high, main, and baseline profile
   b. Frame rate and resolution: 12fps in 2592x1944 (5MP) 360 degree overview
   c. Streaming: Multiple, individually configurable streams in H.264 with controllable frame rate and bandwidth.
   d. Settings: Wide dynamic range (WDR), remote back focus, remote zoom, backlight compensation, compression, color, contrast, white balance, exposure control
3. Audio:
   a. Streaming: Two-way, full-duplex with echo cancellation and noise reduction
   b. Compression: AAC-LC 8/16 kHz, G.711 PCM 8 kHz, G.726 ADCM 8 kHz, all with configurable bit rate
4. Network:
   a. Security: Password protection, IP address filtering, HTTPS encryption
   b. Supported protocols: IPv4 and IPv6, HTTP and HTTPS, SSL/TLS
   c. Application platform: ONVIF profile S and G
5. Interface:
   a. Digital Video Output: HDMI Type Db

b. Network Port: RJ-45, 100BASE-TX
c. Terminal Block I/O: 1 alarm input, 1 alarm output
d. Card Slot: SD x 1

6. General:
a. Casing: IP66 rated, IK-10 impact-resistant aluminum casing with transparent polycarbonate cover and dehumidifying membrane
b. Power: Power over Ethernet IEEE 802.3af Class 2, max 5.1W

C. Manufacturers:
1. Axis
a. #0548-001, “M3037-PVE” network panoramic camera, 5MP resolution
b. #5503-901, “T94F01L” drop ceiling kit for M3037-series cameras
2. Or equal

2.9 <CONFIRM IF REQUIRED> NETWORK CORNER-MOUNT CAMERAS

A. Application: High-security corner-mount cameras with built-in infrared illuminators.

B. Patient Observation Cameras:
1. Axis
a. Image sensor: Progressive scan CMOS 1/3” sensor
b. Lens: Varifocal 2.5-6mm F1.2, remote focus and zoom, IR corrected, P-Iris control, megapixel resolution
c. Day/Night: Automatic, removable IR cut filter
d. Illumination: Color 0.1 lux F1.2, B/W 0.02 lux F1.2
e. Shutter Speed: 1/24,500 s to 2 s
f. Horizontal Viewing Angle: 105 to 49 degrees
g. Vertical Viewing Angle: 79 to 37 degrees
2. Video:
a. Video compression: H.264 high, main, and baseline profile
b. Frame rate and resolution: 30fps in 1280 x 960
c. Streaming: Multiple, individually configurable streams in H.264 with controllable frame rate and bandwidth.
d. Settings: Wide dynamic range (WDR), remote back focus, remote zoom, backlight compensation, compression, color, contrast, white balance, exposure control
3. Audio:
a. Streaming: Two-way, full-duplex with echo cancellation and noise reduction
b. Compression: AAC-LC 8/16 kHz, G.711 PCM 8 kHz, G.726 ADCM 8 kHz, all with configurable bit rate
4. Network:
a. Security: password protection, IP address filtering, HTTPS encryption
b. Supported protocols: IPv4 and IPv6, HTTP and HTTPS, SSL/TLS
c. Application platform: ONVIF profile S and G
5. Interface:
a. Network Port: RJ-45, 100BASE-TX
b. Terminal Block I/O: 1 alarm input, 1 alarm output
c. Audio: 3.5mm mic line in/out
d. Card Slot: SD x 1
6. General
a. Construction: Stainless steel enclosure with polycarbonate window designed to be mounted into a 90° corner.
b. Power: Power over Ethernet IEEE 802.3af Class 3, max 8.7W

C. Manufacturers:
   1. Axis
      a. #0710-001, “Q8414-LVS” series high-security corner-mount dome camera with built-in IR illuminators, white
   2. Or equal

PART 3 EXECUTION

3.1 EXAMINATION

A. Install all system components including Owner furnished equipment, and appurtenances in accordance with the manufacturer's instructions, and as shown, and shall furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.

B. Visit the site and verify that site conditions are in agreement with the design package. Report all changes to the site or conditions that will affect performance of the system to the Owner in a report. The Contractor shall not take any corrective action without written permission from the Owner and Owner.

C. The Contractor shall perform a field survey, and furnish a report to the Owner as part of the site survey report. The Contractor shall be held responsible for repair costs due to Contractor negligence or abuse of Owner equipment.

D. Verify that all surfaces and areas are ready to receive work.

E. Verify field measurements as shown on drawings and as instructed by manufacturer.

F. Verify that required utilities are available, in proper location, and ready for use.

3.2 INSTALLATION

A. General:
   1. Install the video surveillance system related equipment as specified by the manufacturer and as shown, provide mounting hardware sized appropriately to secure each device for conditions encountered at the site; connect signal lines and AC power to equipment.
   2. Ensure that:
      a. All applicable statutes, ordinances, regulations, license requirements and codes are fully complied with.
      b. All required permits are obtained.
      c. All required inspections are conducted.
      d. All necessary certificates are issues, obtained, and delivered to the Owner.
      e. All equipment installations and mounting are in strict accordance with requirements for applicable seismic classification.

B. Video Management Software:
   1. Coordinate with Owner’s IT and Security representatives to set the following criteria:
      a. Administrator and operator passwords
      b. Camera and video device nomenclature
      c. Maximum bitrate (assume 1-2MB per interior camera, 3-4MB per exterior camera) and bandwidth throttle, if any

d. Camera groups, salvos, and operator views
e. PTZ camera presets
f. Mapping features and criteria for a fully interactive graphical display of each floor plan
g. Alarm events and integration into the access control system

C. NVR Servers:
1. Rack mount servers and storage arrays in the Server room. Coordinate with Owner's IT and Security representatives for exact location.
2. Connect keyboard, video, and mouse cables to KVM switch within rack mounted LCD console.

D. Network Cameras:
1. Ceiling-Mount:
a. Provide flush ceiling mount kit for fixed network cameras within interior accessible ceiling space. Install camera body above ceiling line so only lower polycarbonate dome and trim ring is exposed.
b. Field determine exact placement of cameras installed in interior accessible ceiling to ensure complete coverage of targeted area.
2. Corner-Mount:
a. Install cameras within rooms in a 90 degree corner as shown on project drawings. Install camera body so that the casing is square and plumb with the ceiling, walls, and surrounding environment.
b. Adjust the wide dynamic range, gain control, and noise reduction settings on each camera as required to provide clear and crisp video images.

3.3 TESTING

A. General:
1. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing. The Owner will witness all performance verification. Written permission shall be obtained from the Owner before proceeding with the next phase of testing. Original copies of all data produced during performance verification shall be turned over to the Owner at the conclusion of each phase of testing prior to Owner approval of the test.
2. Coordinate testing requirements with the General Contractor and provide specific information on pre-acceptance and final acceptance testing activities so that they can be entered into the overall construction schedule.

B. Cable Testing:
1. All cables and termination hardware shall be 100% tested for defects in the installation and the materials used in order to verify performance under installed conditions. All conductors of each installed cable and system component shall be verified usable by the contractor.
2. Testing for the horizontal structured cabling serving the video surveillance system provided by under Section 27 15 13 - Communications Horizontal Copper Cabling. <CONFIRM SECTION>

C. Pre-Acceptance Testing:
1. The Contractor shall perform a 100% pre-acceptance test to verify operation of the video surveillance system prior to the final acceptance test with the Owner.
2. Pre-Acceptance Testing activities shall not occur until Contractor has ensured that all punch list items have been remedied. If conditions exist that may cause degradation or interference with any security device, the Contractor shall inform the Owner.

3. The pre-acceptance testing shall, as a minimum, include:
   a. Verification that any signal or control cabling have been installed, tested, and approved as specified.
   b. Verification that cameras are properly installed and provide clear, crisp images in the specified format and resolution.
   c. Verification that current recording configuration provides the minimum required storage (i.e. 30 days, etc.).
   d. Verification that client software is able to view live video and recorded video. Verify graphical mapping and alarm management screens.
   e. Verify integration with specified access control system for automatic camera call-up on alarm with proper alarm/event recording parameters.
4. Document the results of the pre-acceptance testing using approved test forms. Report shall indicate the system has been properly calibrated, tested, and is ready to begin final acceptance testing with the Owner.

D. Acceptance Testing
1. Upon successful completion of Pre-Acceptance Testing, the Contractor shall demonstrate to the Owner that the completed video surveillance system complies with the contractor requirements. Acceptance Testing shall not commence until receipt of approved Pre-Acceptance Testing activities based on the Contractor's written report.
2. Using approved test procedures, all physical and functional requirements of the project shall be demonstrated and shown.
3. The Owner may terminate Acceptance Testing at any time when the system fails to perform as specified. Upon termination of testing by the Owner or by the Contractor, the Contractor shall submit a report outlining the required repairs to the Owner then commence system repairs upon direction by the Owner. Upon successful completion of the Acceptance Testing, the Contractor shall deliver test reports and other documentation as specified to the Owner.

3.4 TRAINING

A. Training shall be supplied as part of the Contractors work. Specifically, an authorized individual familiar with the video surveillance system and related subsystems as specified herein shall conduct the training.

B. Training shall provide information regarding the operation of the systems, diagnostics, as well as any other aspects required to provide a knowledge base to manage the video surveillance system.

C. <CONFIRM TRAINING REQUIREMENTS> The Contractor shall coordinate four (4) separate training sessions at least two (2) weeks prior to system turnover for a class no more than eight (8) people. Classes shall be coordinated to include all shifts for all operators. If required, classes will be split up to accommodate the Owner.
1. Session 1:
   a. A half-day session oriented towards familiarizing operators with basic commands of the video management client software.
2. Session 2:
   a. An all-day session detailing system administration that shall include, but not limited to, replacing system diagnostics, changing camera recording configurations, adding/deleting cameras, troubleshooting, as well as any other item necessary to manage the video surveillance system.
3. Session 3:

a. Performed one week prior to system turnover and shall be an all-day session that shall cover system administration and basic operator training as described in Sessions 1 and 2.

4. Session 4
   a. The last and final training session shall be an all-day session that shall recap all administration, basic operator commands and shall be completed post-occupancy at a time coordinated with the Owner. This session shall cover both administration and basic operator commands and also allows the Owner to comment on the performance of the system.

END OF SECTION 28 23 13

SECTION 31 10 00 - SITE CLEARING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 01 57 13 - Temporary Erosion and Sediment Control.

D. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

E. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

F. Section 31 22 00 - Grading: Topsoil removal.

G. Section 31 22 00 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

H. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:
   1. Vegetation removal limits.
   2. Areas for temporary construction and field offices.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 SITE CLEARING

A. Comply with other requirements specified in Section 01 70 00.

B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.2 EXISTING UTILITIES AND BUILT ELEMENTS

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. Protect existing structures and other elements that are not to be removed.

3.3 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.

B. Do not remove or damage vegetation beyond the limits indicated on drawings.

C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
   1. At vegetation removal limits.

D. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

E. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
   1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
   2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.

F. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.4 DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 31 10 00

SECTION 31 22 00 - GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading the site for site structures.

C. Finish grading.

1.2 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing.

B. Section 31 23 16 - Excavation.

C. Section 31 23 16.13 - Trenching: Trenching and backfilling for utilities.

D. Section 31 23 16.26 - Rock Removal.

E. Section 31 23 23 - Fill: Filling and compaction.

F. Section 32 92 19 - Seeding: Finish ground cover.

G. Section 32 92 23 - Sodding: Finish ground cover.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for general requirements relating to unit prices for this work.

1.4 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of TN, Public Works Department standards.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: See Section 31 23 23.

B. Other Fill Materials: See Section 31 23 23.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Verify the absence of standing or ponding water.

3.2 PREPARATION

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

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage above- and below-grade utilities to remain.

D. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

E. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.

3.3 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

G. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.4 SOIL REMOVAL

A. Remove excess excavated topsoil from site. Soil to be trucked to location determined by owner.

B. Remove excess excavated subsoil from site. Soil to be trucked to location determined by owner.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.5 FINISH GRADING

A. Before Finish Grading:

1. Verify building and trench backfilling have been inspected.
2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth of 3 inches.

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

E. Place topsoil in areas indicated.

F. Place topsoil to the following compacted thicknesses:
1. Areas to be Seeded with Grass: 6 inches.
2. Areas to be Sodded: 4 inches.
3. Flower Beds: 12 inches.

G. Place topsoil during dry weather.

H. Remove roots, weeds, rocks, and foreign material while spreading.

I. Near plants spread topsoil manually to prevent damage.

J. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

K. Lightly compact placed topsoil.

L. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.6 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.7 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect as to remedy.

C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.8 FIELD QUALITY CONTROL

A. See Section 31 23 23 for compaction density testing.

3.9 CLEANING

A. Contact City to see what they want done with unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION 31 22 00

SECTION 31 23 16 - EXCAVATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Trenching for utilities outside the building to utility main connections.

1.2 RELATED REQUIREMENTS

A. Section 01 57 13 - Temporary Erosion and Sedimentation Control: Slope protection and erosion control.

B. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal.

C. Section 31 22 00 - Grading: Soil removal from surface of site.

D. Section 31 22 00 - Grading: Grading.

E. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

F. Section 31 23 23 - Fill: Fill materials, filling, and compacting.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for excavation.

1.4 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS - NOT USED

2.1 MATERIALS

A. Bedding and Fill to Correct Over-Excavation:
   1. See Section 31 23 23 for bedding and corrective fill materials at general excavations.
   2. See Section 31 23 16.13 for bedding and corrective fill materials at utility trenches.

B. Underground Warning Tapes:
   1. See Section for 22 05 53 underground warning tapes at underground plumbing lines.
   2. See Section for 26 05 53 underground warning tapes at underground electrical lines.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

B. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by Architect. If the proposed excavation extends more than 1 foot into the prevailing groundwater, control groundwater intrusion with a comprehensive dewatering procedures, or as directed by Geotechnical Engineer.

3.2 PREPARATION

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

B. See Section 31 10 00 for clearing, grubbing, and removal of existing debris.

C. See Section 31 22 00 for additional requirements.

D. Locate, identify, and protect utilities that remain and protect from damage.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect.

3.3 EXCAVATING

A. Excavate to accommodate construction operations.
   1. Excavate to the specified elevations.
   2. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.
   3. Cut utility trenches wide enough to allow inspection of installed utilities.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Cut utility trenches wide enough to allow inspection of installed utilities.

D. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Remove excavated material that is unsuitable for re-use from site.

G. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 22 00.

H. Contact City to see what they want done with excess excavated material stockpiled on site.

3.4 SUBGRADE PREPARATION

A. See Section 31 23 23 for subgrade preparation at general excavations.

B. See Section 31 23 16.13 for subgrade preparation at utility trenches.

3.5 FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

B. Install underground warning tape at buried utilities according to Sections 21 05 53, 22 05 53, 23 05 53, and 26 05 53.

C. See Section 31 23 23 for fill, backfill, and compaction requirements at general excavations.

D. See Section 31 23 16.13 for fill, backfill, and compaction requirements at utility trenches.

E. See Section 31 22 00 for rough and final grading and topsoil replacement requirements.

3.6 REPAIR

A. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23.

3.7 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

3.8 CLEANING

A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 22 00.

B. Remove excavated material that is unsuitable for re-use from site.

C. Contact City to see what they want done with excess excavated material stockpiled on site.

3.9 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION 31 23 16

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SECTION 31 23 16.13 - TRENCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 31 22 00 - Grading: Site grading.

C. Section 31 23 16 - Excavation: Building and foundation excavating.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for earthwork.

1.4 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.5 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

C. Compaction Density Test Reports.

1.7 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. General Fill: Conforming to State of TN Public Works Department standard.

B. Granular Fill: Coarse aggregate, conforming to State of TN Public Works Department standard.

C. Topsoil: See Section 31 22 00.

2.2 ACCESSORIES

2.3 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.2 PREPARATION

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

B. See Section 31 22 00 for additional requirements.

C. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect.

3.3 TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Cut trenches wide enough to allow inspection of installed utilities.

D. Hand trim excavations. Remove loose matter.

E. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

F. Remove excavated material that is unsuitable for re-use from site.

G. Stockpile excavated material to be re-used in area designated in Section 31 22 00.

H. Remove excess excavated material from site.

I. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

J. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect.

3.4 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.5 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

G. Correct areas that are over-excavated.
   1. Thrust bearing surfaces: Fill with concrete.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.

H. Compaction Density Unless Otherwise Specified or Indicated:
   1. **At Locations under paved areas, sidewalks, and pipping:**
      Cohesive soils: Compaction Density: 95% per ASTM D698
      Cohesionless soils: Compaction Density: 75% relative density per ASTM D4253 & ASTM D 4254)

2. **At locations unpaved areas:**
   Cohesive soils: Compaction Density: 90% per ASTM D698
   Cohesionless soils: Compaction Density: 65% relative density per ASTM D4253 & ASTM D 4254)
3. **Moisture Content at both locations:** -2 to +3 % of optimum

I. Reshape and re-compact fills subjected to vehicular traffic.

3.6 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

3.7 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 2 inch from required elevations.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.8 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").

C. If tests indicate work does not meet specified requirements, remove work, replace and retest at Contractor's cost.

D. Frequency of Tests: once daily minimum, or per inspector's discretion.

3.9 CLEANING

A. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 31 23 16.13

SECTION 31 23 23 - FILL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.2 RELATED REQUIREMENTS

A. Section 01 57 13 - Temporary Erosion and Sediment Control: Slope protection and erosion control.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 31 22 00 - Grading: Site grading.

D. Section 31 23 16 - Excavation: Removal and handling of soil to be re-used.

E. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for earthwork.

1.4 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.5 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

D. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Compaction Density Test Reports.

1.7 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

1.8 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. General Fill: Conforming to State of TN Highway Department standard.

B. Structural Fill: Conforming to State of TN Highway Department standard.

C. Granular Fill: Coarse aggregate, conforming to State of TN Highway Department standard.

D. Sand: Conforming to State of TN Highway Department standard.

E. Topsoil: Topsoil excavated on-site.
   1. Select.
   2. Graded.
   3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
   4. Acidity range (pH) of 5.5 to 7.5.
   5. Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.
   6. Conforming to ASTM D2487 Group Symbol OH.

2.2 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 EXAMINATION

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

B. See Section 31 22 00 for additional requirements.

C. Verify areas to be filled are not compromised with surface or ground water.

3.2 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.3 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

G. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

H. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 100 percent of maximum dry density.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

I. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.
   2. At other locations: 95 percent of maximum dry density.

J. Reshape and re-compact fills subjected to vehicular traffic.

K. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

3.5 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 31 23 23

SECTION 313116
TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chemical soil treatment.

B. Termite-resistant vapor barrier sheet.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Vapor barrier placement under concrete slab-on-grade.

1.03 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs 2017.

C. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act 2006.

1.04 SUBMITTALS

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

B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.

C. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.

D. Test Reports: Indicate regulatory agency approval reports when required.

E. Manufacturer's Certificate: Certify that toxicants meet or exceed specified requirements.

F. Certificate of compliance from authority having jurisdiction indicating approval of toxicants.

G. Installer Qualifications: Company specializing in performing work of the type specified and with minimum five years of documented experience and licensed within the State of Tennessee.

H. Maintenance Data: Indicate re-treatment schedule .

I. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year installer's warranty against damage to building caused by termites.
   1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.

C. Termite-Resistant Vapor Barrier Sheet: Provide five year manufacturer's limited warranty.

PART 2 PRODUCTS

2.01 CHEMICAL SOIL TREATMENT

A. Toxicant Chemical: EPA Title 7, United States Code, 136 through 136y approved; synthetically color dyed to permit visual identification of treated soil.

B. Diluent: Recommended by toxicant manufacturer.

C. Manufacturers:
   1. Bayer Environmental Science Corp: www.backedbybayer.com/pest-management/#sle.Bayer Environmental Science Corp: www.backedbybayer.com/pest-management/#sle.Bayer Environmental Science Corp: www.backedbybayer.com/pest-

management/#sle.
2. FMC Professional Solutions: www.fmcprosolutions.com/#sle.
3. Syngenta Professional Products: www.syngentaprofessionalproducts.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

D. Mixes: Mix toxicant to manufacturer's instructions.

2.02 **TERMITE BARRIER SHEET**

A. Termite-Resistant Vapor Barrier Sheet: Plastic sheet, complying with ASTM E1745, Class C; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs, and for exclusion of subterranean termites.

B. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.

C. Manufacturers:
1. Stego Technology LLC; Pango Wrap with Pango Tape: www.stegoindustries.com/#sle.
2. Or equal..
3. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

3.02 **APPLICATION - CHEMICAL TREATMENT**

A. Comply with requirements of U.S. EPA and applicable state and local codes.

B. Spray apply toxicant in accordance with manufacturer's instructions.

C. Apply toxicant at following locations:
1. Under Slabs-on-Grade.
2. At Both Sides of Foundation Surface.

D. Under slabs, apply toxicant immediately prior to installation of vapor barrier.

E. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.

F. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

G. Re-treat disturbed treated soil with same toxicant as original treatment.

H. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 **INSTALLATION - BARRIER SHEET**

A. Comply with ASTM E1643.

B. Lap joints minimum 6 inches (150 mm). Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

3.04 **PROTECTION**

A. Do not permit soil grading over treated work.

B. Protect sheet materials from damage after completed installation. Repair damage with manufacturer's recommended products and according to the manufacturer's written instructions.

END OF SECTION

SECTION 32 11 23 - AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aggregate base course.

B. Paving aggregates.

1.2 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Preparation of site for base course.

B. Section 31 23 16.13 - Trenching: Compacted fill over utility trenches under base course.

C. Section 31 23 23 - Fill: Compacted fill under base course.

D. Section 32 12 16 - Asphalt Paving: Finish asphalt courses.

E. Section 32 13 13 - Concrete Paving: Finish concrete surface course.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for earthwork.

1.4 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

G. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.6 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When aggregate materials need to be stored on site, locate where directed by Owner.

C. Aggregate Storage, General:
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.1 MATERIALS

A. Coarse Aggregate: Coarse aggregate, conforming to State of TN Highway Department standard.

B. Fine Aggregate: Sand; conforming to State of TN Highway Department standard.

2.2 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.

B. Where aggregate materials are specified using ASTM D2487 classification, testing of samples for compliance will be provided before delivery to site.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.3 INSTALLATION

A. Spread aggregate over prepared substrate to a total compacted thickness of 6 inches.

B. Place aggregate in maximum 6 layers and roller compact to specified density.

C. Level and contour surfaces to elevations and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation From Design Elevation: Within 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.

C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D698 ("standard Proctor"), or ASTM D1557 ("modified Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade and paving.

3.6 CLEANING

A. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 32 11 23

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SECTION 32 12 16 - ASPHALT PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aggregate base course.

B. Single course bituminous concrete paving.

1.2 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Preparation of site for paving and base.

B. Section 31 23 23 - Fill: Compacted subgrade for paving.

C. Section 32 17 13 - Parking Bumpers: Concrete bumpers.

D. Section 32 17 23.13 - Painted Pavement Markings: Concrete bumpers.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices for requirements applicable to this section.

1.4 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 1965 (2004).

B. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; 1997.

C. AI MS-19 - A Basic Asphalt Emulsion Manual; Fourth Edition.

1.5 PERFORMANCE REQUIREMENTS

A. Design paving and subbase in parking areas for parking.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with State of TN Highways standard.

B. Mixing Plant: Conform to State of TN Highways standard.

C. Obtain materials from same source throughout.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for paving work on South Precinct property.

1.8 FIELD CONDITIONS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aggregate for Base Course: In accordance with State of TN Highways standards.

B. Aggregate for Binder Course: In accordance with State of TN Highways standards.

C. Aggregate for Wearing Course: In accordance with State of TN Highways standards.

D. Fine Aggregate: In accordance with State of TN Highways standards.

E. Primer: In accordance with State of TN Highways standards.

F. Tack Coat: Homogeneous, medium curing, liquid asphalt.

2.2 ASPHALT PAVING MIXES AND MIX DESIGN

A. Base Course: State of TN Highways standards.

B. Wearing Course: State of TN Highways standards.

2.3 SOURCE QUALITY CONTROL

A. Test mix design and samples in accordance with AI MS-2.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.2 BASE COURSE

A. Place and compact base course.

3.3 PREPARATION - PRIMER

A. Apply primer in accordance with manufacturer's instructions.

B. Apply primer on aggregate base or subbase at uniform rate of 0.35 gal/sq yd.

C. Use clean sand to blot excess primer.

3.4 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions.

B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 0.1 gal/sq yd.

3.5 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Install Work in accordance with State of TN Highways standards.

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Place to 1.5 inch compacted thickness.

D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.6 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.

C. Variation from True Elevation: Within 1/2 inch.

3.7 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.8 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 2 days or until surface temperature is less than 140 degrees F.

3.9 SCHEDULE

A. Pavement at Parking Areas: Two course; binder course of of 1-1/2 inch (light-duty) or 2-1/2 inch (heavy-duty), wearing course of 1-1/2 inch compacted thickness. Refer to plan details.

END OF SECTION 32 12 16

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SECTION 32 13 13 - CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete sidewalks, ramps, and integral curbing.

1.2 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 03 30 00 - Cast-in-Place Concrete.

1.3 PRICE AND PAYMENT PROCEDURES

A. Concrete paving is to be provided by the unit price method.

B. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

1.4 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

B. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.

C. ACI 305R - Hot Weather Concreting; 2010.

D. ACI 306R - Cold Weather Concreting; 2010.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

G. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.

H. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.

I. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

J. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

K. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

L. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

M. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

N. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

O. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

P. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.1 PAVING ASSEMBLIES

A. Concrete sidewalks and ramps: 4,000 psi 28 day concrete, 4 inches thick Portland cement with light broom finish.

2.2 FORM MATERIALS

A. Wood or Steel form material, profiled to suit conditions.

B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).

2.3 CONCRETE MATERIALS

A. Obtain cementitious materials from same source throughout.

B. Cement: ASTM C150/C150M, Normal - Type I or II Portland cement, gray color.

C. Fine and Coarse Mix Aggregates: ASTM C33/C33M gradation size #67, 3/4" to #4, clean crushed gravel.

D. Fly Ash: ASTM C618, Class C or F.

E. Calcined Pozzolan: ASTM C618, Class N.

F. Silica Fume: ACI 211.1.

G. Water: Clean, and not detrimental to concrete.

H. Air-Entraining Admixtures: ASTM C260/C260M.

I. Chemical Admixtures: ASTM C494/C494M, Type A - Water Reducing, Type C - Accelerating, and Type G - Water Reducing, High Range and Retarding.

2.4 ACCESSORIES

A. Curing Compound: ASTM C309, Type 1, Class A.

2.5 CONCRETE MIX DESIGN

A. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

B. Concrete Properties:
   1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; 4,000 psi.

2.6 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.2 SUBBASE

A. See Section 32 11 23 for construction of base course for work of this Section.

3.3 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Notify Architect minimum 24 hours prior to commencement of concreting operations.

3.4 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.5 COLD AND HOT WEATHER CONCRETING

A. Follow recommendations of ACI 305R when concreting during hot weather.

B. Follow recommendations of ACI 306R when concreting during cold weather.

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.6 PLACING CONCRETE

A. Coordinate installation of snow melting components.

B. Place concrete in accordance with ACI 304R.

C. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.7 JOINTS

A. Align curb, gutter, and sidewalk joints.

B. Place 3/8 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
   1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
   2. Secure to resist movement by wet concrete.

C. Provide scored joints.

D. Saw cut contraction joints 1/8 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.8 FINISHING

A. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/8 inch radius.

B. Curbs and Gutters: Light broom, texture parallel to pavement direction.

C. Inclined Vehicular Ramps: Broomed perpendicular to slope.

D. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.9 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.10 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
   1. Provide free access to concrete operations at project site and cooperate with appointed firm.

2. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.
   1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.11 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian or vehicular traffic over pavement for 7 days minimum after finishing.

END OF SECTION 32 13 13

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SECTION 32 17 13 - PARKING BUMPERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Precast concrete parking bumpers and anchorage.

1.2 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

1.3 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

B. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

C. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

D. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2014.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.1 MATERIALS

A. Parking Bumpers: Precast concrete, conforming to the following:
   1. Nominal Size: 6 inches high, 9 inches wide, 6 feet long.
   2. Cement: ASTM C150/C150M, Portland Type I - Normal; gray color.
   3. Concrete Materials: ASTM C330/C330M aggregate, water, and sand.
   4. Reinforcing Steel: ASTM A615/A615M, deformed steel bars; unfinished, strength and size commensurate with precast unit design.
   5. Air Entrainment Admixture: ASTM C260/C260M.
   6. Concrete Mix: Minimum 5,000 psi compressive strength after 28 days, air entrained to 5 to 7 percent.
   7. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
   8. Embed reinforcing steel, and drill or sleeve for two dowels.
   9. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
   10. Minor patching in plant is acceptable, providing appearance of units is not impaired.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install units without damage to shape or finish. Replace or repair damaged units.

B. Install units in alignment with adjacent work.

END OF SECTION 32 17 13

SECTION 32 17 23.13 - PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Parking lot markings, including parking bays and handicapped symbols.

1.2 RELATED REQUIREMENTS

A. Section 32 12 16 - Asphalt Paving.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MATERIALS

A. Line and Zone Marking Paint: MPI (APL) No. 97 Latex Traffic Marking Paint; color(s) as indicated.
   1. Parking Lots: Yellow.
   2. Handicapped Symbols: Blue.

PART 3 EXECUTION

3.1 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.

3.2 PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Clean surfaces thoroughly prior to installation.
   1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.

D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

3.3 INSTALLATION

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown.

E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.

F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on drawings true, sharp edges and ends.
   1. Apply paint in one coat only.
   2. Wet Film Thickness: 0.015 inch, minimum.
   3. Width Tolerance: Plus or minus 1/8 inch.

G. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.

1. Mark the International Handicapped Symbol at indicated parking spaces.
2. Hand application by pneumatic spray is acceptable.

H. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.4 DRYING, PROTECTION, AND REPLACEMENT

A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.

B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.

C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.

D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.

E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.

F. Replace removed markings at no additional cost to Owner.

END OF SECTION 32 17 23.13

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SECTION 32 17 26 - TACTILE WARNING SURFACING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete for sidewalks and platforms.

B. Section 32 13 13 - Concrete Paving: Concrete sidewalks.

1.3 REFERENCE STANDARDS

A. 49 CFR 37 - Transportation Services for Individuals with Disabilities (ADA); current edition.

B. AASHTO LRFD - Bridge Design Specifications, Customary U.S. Units (6th Edition); 2012.

C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

E. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2011.

F. ASTM C501 - Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser; 1984 (Reapproved 2009).

G. ASTM C903 - Standard Practice for Preparing Refractory Castable Specimens by Cold Gunning; 2010.

H. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine; 2011.

I. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2014.

J. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).

K. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.

L. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2010.

M. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2010.

N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

O. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.

P. ATBCB PROWAG - Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way; 2011.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's product data, standard details, details specific to this project; written installation and maintenance instructions.

C. Warranty: Submit manufacturer warranty; complete forms in Owner's name and register with manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver to project site in manufacturer's protective wrapping and in manufacturer's unopened packaging.

B. Store covered and elevated above grade and in manufacturer's unopened packaging until ready for installation. Maintain at ambient temperature between 40 and 90 degrees F.

1.6 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Plastic Tiles: Provide manufacturer's standard five year warranty against manufacturing defects, breakage or deformation.

PART 2 PRODUCTS

2.1 TACTILE AND DETECTABLE WARNING DEVICES

A. Plastic Tactile and Detectable Warning Tiles: ADA Standards compliant, glass fiber and carbon fiber reinforced, exterior grade, matte finish polyester sheet with truncated dome pattern, solid color throughout, internal reinforcing of sheet and of truncated domes, integral radius cut lines on back face of tile; with factory applied removable protective sheeting.
   1. Material Properties:
      a. Water Absorption: 0.20 percent, maximum, when tested in accordance with ASTM D570.
      b. Slip Resistance: 0.50 minimum dry static coefficient of friction, when tested in accordance with ASTM D2047.
      c. Compressive Strength: 25,000 pounds per square inch, minimum, when tested in accordance with ASTM D695.
      d. Tensile Strength: 10,000 pounds per square inch, minimum, when tested in accordance with ASTM D638.
      e. Flexural Strength: 25,000 pounds per square inch minimum, when tested in accordance with ASTM D790.

f. Chemical Stain Resistance: No reaction to 1 percent hydrochloric acid, motor oil, calcium chloride, gum, soap solution, bleach, or antifreeze, when tested in accordance with ASTM D543.
g. Abrasion Resistance: 300, minimum, when tested in accordance with ASTM C501.
h. Flame Spread Index: 25, maximum, when tested in accordance with ASTM E84.
i. Accelerated Weathering: Delta-E of less than 5.0 at 2,000 hours exposure, when tested in accordance with ASTM G155.
j. Adhesion: No delamination of tile prior to board failure in a temperature range of 20 to 180 degrees F, when tested in accordance with ASTM C903.
k. Loading: No damage when tested according to AASHTO LRFD test method HS20.
l. Salt and Spray Performance: No deterioration or other defect after 200 hours of exposure, when tested in accordance with ASTM B117.

2. Installation Method: Cast in place.
3. Shape: Rectangular.
4. Dimensions: 24 inches by 432 inches.
5. Pattern: In-line pattern of truncated domes complying with ADA Standards.
6. Color: As selected by Architect from manufacturer's standard range.

2.2 ACCESSORIES

A. Fasteners: ASTM A666, Type 304 stainless steel
   1. Type: Countersunk, color matched composite sleeve anchors
   2. Size: 1/4 inch diameter and 1-1/2 inches long.

B. Adhesive: Type recommended and approved by surfacing tile manufacturer.

C. Sealant: Elastomeric sealant of color to match adjacent surfaces; approved by surfacing tile manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work area is ready to receive work:
   1. If existing conditions are not as required to properly complete the work of this section, notify Architect.
   2. Do not proceed with installation until deficiencies in existing conditions have been corrected.

B. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.2 INSTALLATION, GENERAL

A. Install in accordance with manufacturer's written instructions.
   1. Do not install damaged, warped, bowed, dented, abraded, or otherwise defective units.
   2. Do not install when ambient or substrate temperature has been below 40 degrees F during the preceding 8 daylight hours.

B. Field Adjustment:
   1. Cut units to size and configuration shown on drawings.
   2. Locate relative to curb line in compliance with ATBCB PROWAG, Sections 304 and 305.

3. Orient so dome pattern is aligned with the direction of ramp.

C. Install units fully seated to substrate, square to straight edges and flat to required slope.

3.3 CLEANING PLASTIC UNITS

A. Remove protective plastic sheeting within 24 hours of installation.

B. Remove excess sealant or adhesive from joints and edges.

C. Clean four days prior to date of scheduled inspection.

3.4 PROTECTION

A. Protect installed units from traffic, subsequent construction operations or other imposed loads until concrete is fully cured.

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

END OF SECTION 32 17 26

SECTION 32 92 19 - SEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Seeding, mulching and fertilizer.

D. Maintenance.

1.2 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Topsoil material.

B. Section 31 22 00 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

C. Section 31 23 23 - Fill: Topsoil material.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

1.4 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Maintenance Contract.

1.6 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS

2.1 SEED MIXTURE

A. Seed Mixture: Refer to Landscape Plans

2.2 SOIL MATERIALS

A. Topsoil: Excavated from site and free of weeds.

2.3 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.2 PREPARATION

A. Prepare subgrade in accordance with Section 31 22 00.

B. Place topsoil in accordance with Section 31 22 00.

3.3 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.4 SEEDING

A. Apply seed at a rate of 4 lbs per 1000 sq ft evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Planting Season: April 20 to May 15 for spring planting & August 1 to September 15 for fall planting, unless otherwise approved by Engineer.

D. Do not sow immediately following rain, when ground is too dry, or during windy periods.

E. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

F. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

G. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

3.5 PROTECTION

A. Protect seeded slopes against erosion with erosion netting or other methods approved by Engineer.

B. Protect seeded area against traffic or other use by erecting barricades and placing warning signs.

3.6 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will not pay for water.

B. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

C. Provide a separate maintenance contract for specified maintenance service.

D. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

E. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

F. Neatly trim edges and hand clip where necessary.

G. Water to prevent grass and soil from drying out.

H. Roll surface to remove minor depressions or irregularities.

I. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

J. Immediately reseed areas that show bare spots.

K. Protect seeded areas with warning signs during maintenance period.

END OF SECTION 32 92 19

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SECTION 32 92 23 - SODDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparation of subsoil.

B. Fertilizing.

C. Sod installation.

1.2 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Topsoil material.

B. Section 31 22 00 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

C. Section 31 23 23 - Fill: Topsoil material.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

1.4 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.5 REFERENCE STANDARDS

A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding; 2006.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.7 QUALITY ASSURANCE

A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience, and certified by the State of TN.

B. Installer Qualifications: Company approved by the sod producer.

1.8 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of fertilizer and herbicide mixture.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver sod on pallets. Protect exposed roots from dehydration.

B. Do not deliver more sod than can be laid within 24 hours.

1.10 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sod: TPI (SPEC), Certified Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft. Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.

B. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

2.2 ACCESSORIES

A. Wood Pegs: Softwood, sufficient size and length to ensure anchorage of sod on slope.

2.3 SOURCE QUALITY CONTROL

A. Provide analysis of topsoil fill under provisions of Section 01 40 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this section.

3.2 PREPARATION

A. Prepare subgrade in accordance with Section 31 22 00.

3.3 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to installation of sod.

C. Apply fertilizer no more than 48 hours before laying sod.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.4 LAYING SOD

A. Moisten prepared surface immediately prior to laying sod.

B. Lay sod immediately after delivery to site to prevent deterioration.

C. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.

D. Where new sod adjoins existing grass areas, align top surfaces.

E. Where sod is placed adjacent to hard surfaces, such as curbs, pavements, etc., place top elevation of sod 1/2 inch below top of hard surface.

F. On slopes 6 inches per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.

G. Prior to placing sod, on slopes exceeding 8 inches per foot or where indicated, place wire mesh over topsoil. Securely anchor in place with wood pegs sunk firmly into the ground.

H. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.

I. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding 1200 lbs.

3.5 MAINTENANCE

A. See Section 32 01 90 - Operation and Maintenance of Planting for post-occupancy maintenance.

B. Provide maintenance at no extra cost to Owner; Owner will not pay for water.

END OF SECTION 32 92 23

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SECTION 33 05 13 - MANHOLES AND STRUCTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Modular precast concrete manhole sections with tongue-and-groove joints with masonry transition to lid frame, covers, anchorage, and accessories.

B. Monolithic FRP manholes with transition to lid frame, covers, anchorage, and accessories.

1.2 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

B. Manhole: By the unit. Includes excavating, concrete base pad, concrete manhole sections, FRP manhole sections, brick masonry manhole construction, brick masonry transition to cover frame, cover frame and cover, to indicated depth, forming and sealing pipe inlets and outlets.

1.3 REFERENCE STANDARDS

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; 2011.

B. ASTM C478 - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections; 2015.

C. ASTM C478M - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections [Metric]; 2015.

D. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals; 2008 (Reapproved 2013).

E. ASTM C923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals [Metric]; 2008b (Reapproved 2013).

F. ASTM D3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells; 2012.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate manhole locations, elevations, piping sizes and elevations of penetrations.

C. Manufacturer's Qualification Statement.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.6 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 (ASTM C478M), with resilient connectors complying with ASTM C923 (ASTM C923M).

B. Manhole Sections: ASTM D3753, glass-fiber reinforced polyester with integral steps.

2.2 CONFIGURATION

A. Shaft Construction: Concentric with concentric cone top section; lipped male/female dry joints; sleeved to receive pipe sections.

B. Shape: Cylindrical.

C. Clear Inside Dimensions: 48 inches diameter.

D. Design Depth: As indicated.

E. Clear Lid Opening: As indicated.

F. Pipe Entry: Provide openings as indicated.

G. Steps: As indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify excavation for manholes is correct.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.3 MANHOLES

A. Place concrete base pad, trowel top surface level.

B. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.

C. Cut and fit for pipe.

D. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

E. Coordinate with other sections of work to provide correct size, shape, and location.

3.4 MASONRY WORK

A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

B. Lay masonry units in running bond. Course one unit and one mortar joint to equal 8 inches.

C. Form concave mortar joints.

D. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

E. Install joint reinforcement 16 inches on center.

F. Place joint reinforcement in first and second horizontal joints above base pad and below lid frame opening.

END OF SECTION 33 05 13

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SECTION 33 14 16 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water pipe for site conveyance lines.

B. Pipe and fittings for site water lines including domestic water lines.

1.2 RELATED REQUIREMENTS

A. Section 31 23 16 - Excavation: Excavating of trenches.

B. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

C. Section 31 23 23 - Fill: Bedding and backfilling.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

1.4 REFERENCE STANDARDS

A. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.

B. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2015.

C. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2013.

D. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).

E. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution; 2007.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with utility company requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.1 WATER PIPE

A. PVC Pipe: ASTM D1785, Schedule 40.
   1. Fittings: ASTM D2466, PVC.
   2. Joints: ASTM D2855, solvent weld.

B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service" in large letters.

2.2 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 23 16.13.

B. Cover: As specified in Section 31 23 16.13.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.3 TRENCHING

A. See the sections on excavation and fill for additional requirements.

B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.4 INSTALLATION - PIPE

A. Establish elevations of buried piping to ensure not less than 1.5 ft of cover.

B. Install pipe to indicated elevation to within tolerance of 5/8 inches.

C. Route pipe in straight line.

D. Install pipe to allow for expansion and contraction without stressing pipe or joints.

E. Slope water pipe and position drains at low points.

3.5 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

END OF SECTION 33 14 16

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SECTION 33 31 13 - SITE SANITARY SEWERAGE GRAVITY PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sanitary sewage drainage piping, fittings, and accessories.

B. Connection of building sanitary drainage system to municipal sewers.

C. Cleanout access.

1.2 RELATED REQUIREMENTS

A. Section 31 23 16 - Excavation: Excavating of trenches.

B. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

C. Section 31 23 23 - Fill: Bedding and backfilling.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

1.4 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.5 REFERENCE STANDARDS

A. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.

B. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.

C. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of Sewer taps and lines with size, location and installation of service utilities.

1.7 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.1 SEWER PIPE MATERIALS

A. Provide products that comply with applicable code(s).

B. Plastic Pipe: ASTM D2729, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of 4 inches, bell and spigot style solvent sealed joint end.

C. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.2 BEDDING AND COVER MATERIALS

A. Pipe Bedding Material: As specified in Section 31 23 23.

B. Pipe Cover Material: As specified in Section 31 23 23.

PART 3 EXECUTION

3.1 GENERAL

A. Perform work in accordance with applicable code(s).

3.2 TRENCHING

A. See Section 31 23 16.13 for additional requirements.

B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.3 INSTALLATION - PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D2321.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Connect to building sanitary sewer outlet and municipal sewer system, through installed sleeves.

3.4 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.5 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 31 13

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